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ABSTRACT

UNIACT, a major component of the American College Testing (ACT) Assessment Program, is one of the first interest inventories to employ a new technique for ensuring sex fairness in the reporting of scores. UNIACT was constructed with the goal that distributions of career options suggested to males and females would be similar. It is intended to help junior high school students through adults in the early stages of career planning to identify personally relevant career options. UNIACT reports results for six basic types of vocational interests corresponding to Holland's interest types: science, creative arts, social service, business contact, business detail, and technical. An overview of UNIACT describes the inventory, its historical basis, and interpretive aids. The rationale for sex-balanced interest scores and scales; norming; scale reliability, stability and sex-balance; and the scales' convergent and divergent validity are examined. Criterion-related validity and the scales' appropriateness for minority group members are discussed. Validity evidence includes profiles for over 40,000 persons in 352 educational and occupational groups. Appendices include lists of research reports, the summary profiles, inventory items, scoring procedures, norm tables and the Federal sex-fair compliance statement. (CM)

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Technical Report for the Unisex Edition of the ACT Interest Inventory (UNIACT)

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Five reviewers labored over drafts of this report. We are especially grateful to Richard Johnson of the University of Wisconsin—Madison and Donald Zytowski of Iowa State University for their critiques and suggestions. ACT staff members who reviewed the report were Dick Ferguson, Joan Laing, and Mike Valiga. The authors welcome suggestions from readers that can guide revisions of the report or future research.

Iowa City, Iowa
January 1981

Richard R. Lamb
Dale J. Prediger

CHAPTER 1

OVERVIEW OF THE UNISEX EDITION OF THE ACT INTEREST INVENTORY (UNIACT)

The ACT Interest Inventory, in various editions, is a component of the following ACT programs:

- The ACT Assessment Program (AAP), used by college-bound students in planning for college and in presenting themselves to postsecondary institutions as persons with unique patterns of educational abilities, accomplishments, interests, and needs. Nearly one million persons complete "The ACT" each year.
- The ACT Career Planning Program (ACT CPP), used by high school students, college students, and adults in identifying career options and planning career directions. The ACT CPP contains an ability test battery and an experience survey in addition to the ACT Interest Inventory. An *upper-level edition* serves individuals age 16 and older. A *lower-level edition* serves students in junior and senior high school.
- The Vocational Interest, Experience, and Skill Assessment (VIESA), a self-scored short form of the lower-level edition of the ACT CPP that substitutes self-ratings of skills for ability tests.

The Unisex Edition of the ACT Interest Inventory (UNIACT), the most recent edition of this instrument, is used in the AAP and VIESA. It may replace the editions used in the two levels of the ACT CPP when that program is next revised.

This report compiles new and previously published information about UNIACT's development and psychometric characteristics. (Information about the use of UNIACT, including interpretation procedures, is provided in the user's manual for each program.) The research findings summarized here are based, for the most part, on studies conducted in AGT's Vocational Interest Research Program, which had its formal beginning in 1972. Appendix A provides a comprehensive list of these reports. Key references include ACT Research Reports 67 (Hanson, 1974); 78 (Hanson, Prediger, & Schussel, 1977); and 79 (Prediger & Johnson, 1979); as well as the ACT CPP handbooks (ACT, 1974, 1977).

Description of UNIACT

UNIACT is intended for use by persons (junior high school students through adults) who are in the early stages of career planning or replanning. The primary purpose of UNIACT is to stimulate and facilitate self/career exploration; that is, the exploration of self in relation to careers. UNIACT's major function is to help individuals identify personally relevant educational and vocational (career) options. As discussed in Chapter 2, UNIACT was constructed with the goal that the distributions of career options suggested to males and females would be similar.

As career choices become more complex and work becomes less visible, one of the most difficult tasks faced by adolescents, or by adults considering a career change, is the identification of career options appropriate to personal goals and characteristics. A primary purpose of career guidance is to provide such individuals with a panoramic view of their options in the worlds of work and education, and then to help them find their way in these worlds. Perhaps the term most appropriate for this task is "focused exploration" (Prediger, 1974). UNIACT provides focus to career exploration—not a focus that singles out the "right" occupation, but rather one that points to regions of the world of work that individuals may want to visit and explore. In the process of exploration, they may discover things about themselves and the world of work that they may not have previously considered.

Basic Interest Scales

To facilitate exploration, UNIACT reports results for six basic types of vocational interests corresponding to the six interest types in Holland's (1973) theory of careers. UNIACT scale names and descriptions (with corresponding Holland types and their abbreviations indicated in parentheses) are:

- Science (Investigative - I)
  Investigating and attempting to understand, through reading, research, and discussion, phenomena in the natural sciences.
- Creative Arts (Artistic - A)
  Expressing oneself through activities such as painting, designing, singing, dancing, and writing; artistic appreciation of such activities (e.g., listening to music, reading literature).
- Social Service (Social - S)
  Helping, enlightening, or serving others through activities such as teaching and counseling, working in service-oriented organizations, engaging in social/political studies.
- Business Contact (Enterprising - E)
  Persuading, influencing, directing, or motivating others. Activities include sales supervision and aspects of business management.
- Business Detail (Conventional - C)
  Developing and/or maintaining accurate and orderly files, records, accounts, etc.; designing and/or following systematic procedures for performing business activities.
- Technical (Realistic - R)
  Working with tools, instruments, and mechanical or electrical equipment. Activities include designing, building, repairing machinery and raising crops/animals.

Each of the six UNIACT scales comprises 15 items describing work-related activities (e.g., "write short stories," "determine the origin of rock formations," "balance a checkbook"). The response options for each item are "dislike," "indifferent," and "like." The 90 UNIACT items are listed in Appendix D; Appendix E provides scoring information.

The Data/Ideas and Things/People Summary Scales

Sixty of the 90 UNIACT items are also used to provide scores on two 30-item summary scales. These summary scales assess foundational dimensions of work-related activity preferences—a data/ideas dimension and a things/people dimension. The Data/Ideas and Things/People Summary Scales were derived in a program of research on the structure of interests and occupations. Research in this program suggests that two bipolar dimensions underly Holland's (1973) and Roe's (1956) hexagonal and octagonal arrangement of types (ACT, 1974; Hanson, 1974; Prediger, 1976b, 1981, in press). The compatibility of these dimensions with the hexagonal ordering of interests and occupations proposed by Holland (1973) is shown by Figure 1.1. Definitions of the data, ideas, things, and people work tasks forming the poles of the two dimensions follow:

Data. (Facts, records, files, numbers; systematic procedures for facilitating goods/services consumption by people). "Data activities" involve impersonal processes such as recording, verifying, transmitting, and organizing facts or data representing goods and services. Purchasing agents, accountants, and air traffic controllers work mainly with data.

Ideas. (Abstractions, theories, knowledge, insights, and new ways of expressing something— for example, with words, equations, or music). "Ideas activities" involve intrapersonal processes such as creating, discovering, interpreting, and synthesizing abstractions or implementing applications of abstractions. Scientists, musicians, and philosophers work mainly with ideas.

Things. (Machines, mechanisms, materials, tools, physical and biological processes). "Things activities" involve nonpersonal processes such as producing, transporting, servicing, and repairing. Bricklayers, farmers, and engineers work mainly with things.

People (no alternative terms). "People activities" involve interpersonal processes such as helping, informing, serving, persuading, entertaining, motivating, and directing others (including animals treated as if they were human). Teachers, salespersons, and nurses work mainly with people.

As noted by Prediger (1976a), all occupations have some involvement with these work tasks. But usually only one or two of the work tasks capture the primary purpose or focus of an occupation. For example, a scientist may work with data, but the primary purpose is not to produce or handle data; rather it is to create or apply scientific knowledge. Likewise, an accountant may work with ideas, but the ultimate goal is not to create ideas; rather it is to organize, record, and verify data in a systematic manner.

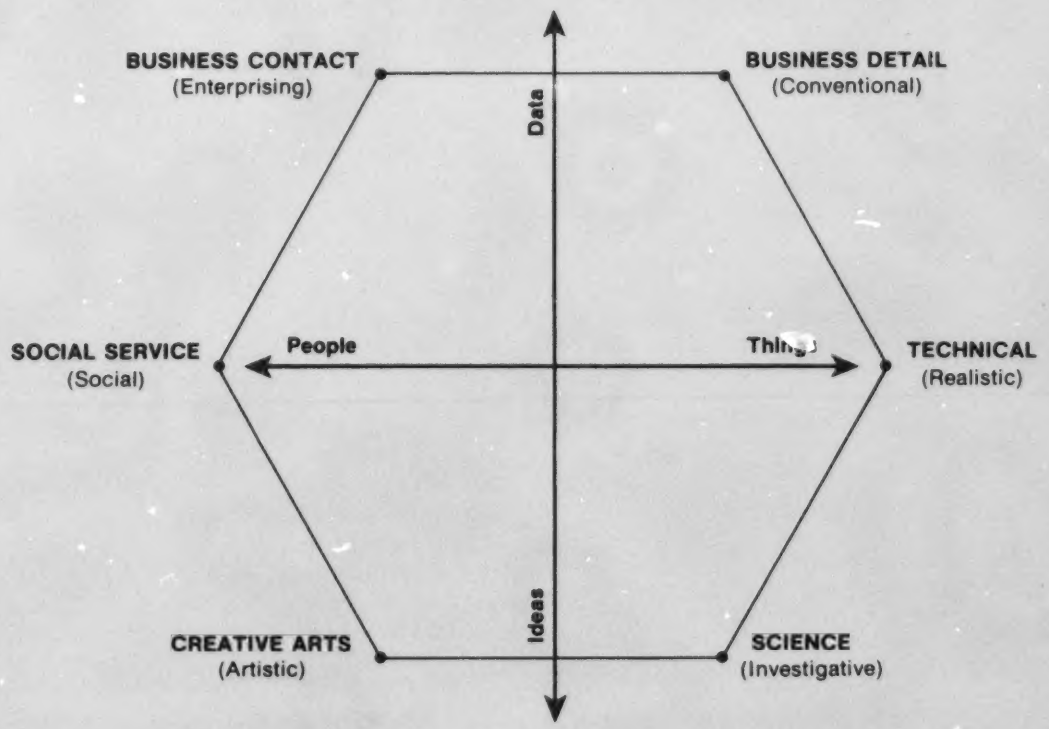


Figure 1.1. Relationship between UNIACT interest scales and the data/ideas and things/people work task dimensions. (Holland types corresponding to UNIACT scales are shown in parentheses.)

Interpretive Aids

Basic Interest Scale Profile

Results for the six basic interest scales are reported in the AAP as normalized standard scores with a mean of 50 and a standard deviation of 10 (a *T* score). In addition, the report includes a profile of percentile ranks plotted in the form of bands encompassing one standard error of measurement. Interpretation instructions encourage score recipients to think of their "true" scores as probably being within the range represented by the bands. (Scores on the basic interest scales are not reported in VIESA.) A sample AAP report for the basic interest scales is shown in Figure 1.2.

World-of-Work Map

As described by Prediger (1976b), the data/ideas and things/people dimensions provide the basis for the ACT Occupational Classification System (ACT-OCS) and World-of-Work Map. The ACT-OCS groups all occupations found in the *Dictionary of Occupational Titles* (U.S. Department of Labor, 1977) into 25 job families which are relatively homogeneous with respect to involvement with data/ideas and things/people. In forming the job families, care was taken to insure that each made sense in terms of the purpose of work and the work setting represented.

In ACT's World-of-Work Map (Figure 1.3), the 25 job families are located in 12 "regions" representing various combinations of data, ideas, things, and people work tasks. Typical occupations in each of the job families are shown in the Job Family List (Figure 1.4). Job families in the list are grouped into six "job clusters" corresponding to Holland's (1973) occupational typology.

Job Family Charts, used in the ACT CPP and VIESA, provide greater coverage of the occupations in each job family. These charts list approximately 600 occupations employing more than 95% of the workers in the U.S. labor force. Within each job family, occupations are grouped according to the amount of education or training typically required for entry.

In order to help persons relate their interests to occupational options, their interest inventory results are used to obtain a region on the World-of-Work Map, and they are encouraged to explore occupations in their region and in the adjacent regions. In VIESA, the World-of-Work Map region is derived from the Data/Ideas and Things/People Summary Scales. In the AAP, which is machine scored, the World-of-Work Map region is based on data/ideas and things/people scores computed as linear composites of the six basic interest scores. (See Appendix E.) As described in Chapter 5, the two procedures yield nearly identical results.

Map of College Majors

In the AAP, the data/ideas and things/people dimensions serve as axes for the Map of College Majors (Figure 1.5). This map shows the locations of 34 different 4-year college majors, and of 18 vocational/technical programs at 2-year colleges. The locations of 4-year majors are based on the scores that approximately 9,200 college seniors attending 16 institutions in 15 states received when they were college-bound students 4 years earlier. The 2-year program locations are based on scores that approximately 6,000 vocational/technical students attending 9 community colleges in 9 states received as college-bound students. Data/ideas and things/people scores are used as coordinates to find a person's location on the Map of College Majors. By comparing their locations with those of majors and programs on the map, persons can see how their interests correspond with those of other college-bound individuals who later specialized in various programs and majors. (Additional details on the development of the Map of College Majors are provided in Chapter 6.)

In summary, the primary purpose of UNIACT and earlier editions of the ACT Interest Inventory is to stimulate and facilitate self/career exploration. Six basic interest scales assess interests corresponding to the typology proposed by Holland (1973). Scores are obtained for the underlying data/ideas and things/people dimensions. These two bipolar dimensions provide the basis for linking interests with occupational options (through the World-of-Work Map) and college programs/majors (through the Map of College Majors).

Historical Basis of UNIACT

The ACT Interest Inventory exists in four editions, the most recent of which is UNIACT. (Each of these editions is individually named.) In this section, the evolution of the various editions is described and evidence of their interrelationship is summarized. Hereafter, the term "ACT Interest Inventory" will be used in the generic sense; that is, in reference to any of the four editions, or in reference to all four editions, collectively.

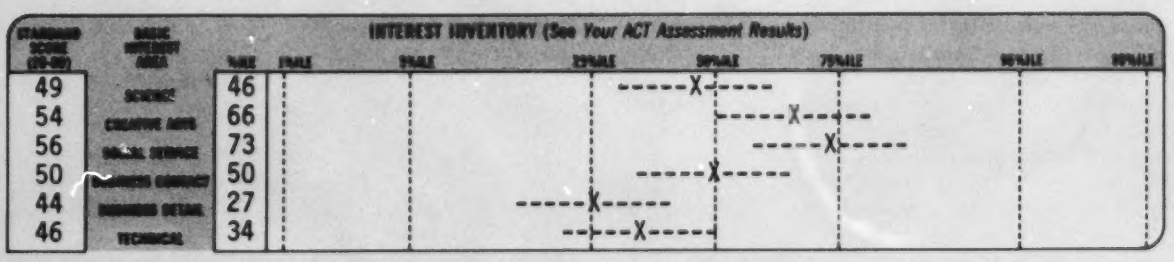


Figure 1.2. Report format for presenting UNIACT basic interest scale results to AAP participants. ("Standard scores" are *T* scores having a mean of 50 and a standard deviation of 10.)

Figure 1.3. The World-of-Work Map

Editions of the ACT Interest Inventory

The development of the various editions of the ACT Interest Inventory is illustrated in Figure 1.6. Depicted at the base of this figure is the ACT Guidance Profile (ACT, 1968), the instrument that served as the foundation for all later forms of the ACT Interest Inventory. Developed under the direction of John Holland while he was associated with ACT, this guidance package included Holland's Vocational Preference Inventory (VPI) (Holland, 1975) as a major component.

The initial edition of the ACT Interest Inventory, the ACT Vocational Interest Profile (ACT VIP), is depicted just above the ACT Guidance Profile in Figure 1.6. Items for the ACT VIP, which was developed for the upper-level edition of the ACT CPP, were drawn from sections of the ACT Guidance Profile (other than the VPI) and from a pool of new items written to provide expanded scale coverage. Six of the eight 10-item scales parallel Holland's typology. Two additional scales (Health and Technical) were added to provide more specific coverage in areas particularly relevant to prospective vocational-technical students. The correspondence of ACT VIP scales (and scales on the other editions of the ACT Interest Inventory) to Holland types is indicated in Table 1.1. The construction, norming, and measurement properties of the ACT VIP are described in the *Handbook for the ACT Career Planning Program* (ACT, 1977).

The ACT VIP served as the basis for two later editions of the ACT Interest Inventory. The first, introduced in 1973, was named the "ACT Interest Inventory" (ACT-IV). (To avoid confusion with the "generic" use of the term "ACT Interest Inventory," this specific edition is referred to in this report only by its abbreviation.) The ACT-IV assesses the Holland types with six 15-item scales. Described by Hanson (1974), this edition was developed for the ACT Assessment Program, and was a component of that program from October of 1973 until the ACT-IV was replaced by UNIACT in October of 1977.

The second edition of the ACT Interest Inventory originating from the ACT VIP was the "alternate form" of the Vocational Interest Profile (ACT VIP-A). This edition was developed for the lower-level version of the ACT CPP, and is described in the handbook for that program (ACT, 1974). Like the ACT-IV, the ACT VIP-A assesses Holland types with six 15-item scales.

Both the ACT-IV and the ACT VIP-A served as the foundation for UNIACT. As discussed in Chapter 3, UNIACT differs from previous editions of the ACT Interest Inventory in that the response distributions of males and of females to each of the items are highly similar. Additionally, UNIACT is the first edition of the ACT Interest Inventory which was not constructed for a program intended primarily for a specific population (e.g., youth in grades 8-12). Instead, UNIACT

BUSINESS SALES & MANAGEMENT JOB CLUSTER

A. PROMOTION AND DIRECT CONTACT SALES
Public relations workers, fashion models, travel agents, sales workers who visit customers (for example real estate brokers, insurance agents, wholesalers, office supplies sales workers)

B. MANAGEMENT AND PLANNING
Hotel, store, and company managers, bankers, executive secretaries, buyers, purchasing agents, small business owners

C. RETAIL SALES AND SERVICES
Sales workers in stores and shops, auto salespersons, retail sales workers

BUSINESS OPERATIONS JOB CLUSTER

D. CLERICAL AND SECRETARIAL WORK
Typists, file clerks, mail clerks, office messengers, receptionists, secretaries

E. PAYING, RECEIVING, AND BOOKKEEPING
Bank tellers, accountants, payroll clerks, grocery checkout clerks, ticket sellers, cashiers, hotel clerks

F. OFFICE MACHINE OPERATION
Adding, billing, and bookkeeping machine operators, computer and data processing machine operators, telephone operators

G. STORAGE, DISPATCHING, AND DELIVERY
Shipping and receiving clerks, stock clerks, truck and airplane dispatchers, delivery truck drivers, cab drivers, mail carriers

TECHNOLOGIES & TRADES JOB CLUSTER

H. HUMAN SERVICES CRAFTS
Barbers, hairdressers, tailors, shoemakers, cooks, chefs, butchers, bakers

I. REPAIRING AND SERVICING HOME AND OFFICE EQUIPMENT
Repairing and servicing - TV sets, appliances, typewriters, telephones, heating systems, photo copiers

J. GROWING AND CARING FOR PLANTS/ANIMALS
Farmers, foresters, ranchers, gardeners, yard workers, groundskeepers, plant nursery workers, animal caretakers, pet shop attendants

K. CONSTRUCTION AND MAINTENANCE
Carpenters, electricians, painters, custodians (janitors), bricklayers, sheet metal workers, construction laborers (buildings, roads, pipelines, etc.)

L. TRANSPORT EQUIPMENT OPERATION
Long haul truck and bus drivers, bulldozer operators, crane operators, forklift operators

M. MACHINE OPERATING, SERVICING, AND REPAIRING
Auto mechanics, machinists, printing press operators, sewing machine operators, service station attendants, laborers and machine operators in factories, mines, lumber camps, etc.

N. ENGINEERING AND OTHER APPLIED TECHNOLOGIES
(For science and medical technicians, see Job Families O and P.) Engineers and engineering technicians, draftsmen and draftswomen, pilots, surveyors, computer programmers.

NATURAL, SOCIAL, & MEDICAL SCIENCES JOB CLUSTER

O. NATURAL SCIENCES AND MATHEMATICS
Biologists, chemists, lab technicians, physicists, geologists, statisticians, agricultural scientists, ecologists

P. MEDICINE AND MEDICAL TECHNOLOGIES
Dentists, doctors, veterinarians, medical technologists and lab workers, pharmacists, X-ray technicians, optometrists, dental hygienists, dietitians

Q. SOCIAL SCIENCES AND LEGAL SERVICES
Sociologists, lawyers, political scientists, psychologists, home economists

CREATIVE & APPLIED ARTS JOB CLUSTER

R. CREATIVE ARTS
Authors, concert singers, musicians, actresses and actors, dancers, artists

S. APPLIED ARTS (VERBAL)
Reporters, technical writers, interpreters, newscasters, newswriters, ad copy writers

T. APPLIED ARTS (VISUAL)
Interior decorators, architects, commercial artists, photographers, fashion designers

U. POPULAR ENTERTAINMENT
Night club entertainers, popular singers and musicians, disc jockeys, circus performers

SOCIAL, HEALTH, & PERSONAL SERVICES JOB CLUSTER

V. EDUCATION AND SOCIAL SERVICES
Teachers, counselors, social workers, librarians, athletic coaches, recreation workers, clergymen and clergywomen

W. NURSING AND HUMAN CARE
Child care aides, nurses, dental assistants, physical therapists, hospital attendants

X. PERSONAL AND HOUSEHOLD SERVICES
Waiters and waitresses, airline stewardesses and stewards, housekeepers, porters, car hops, butlers and maids

Y. LAW ENFORCEMENT AND PROTECTIVE SERVICES
Police officers, building, food, and postal inspectors, watchmen, plant guards, firefighters

Figure 1.4. The ACT Job Family List.

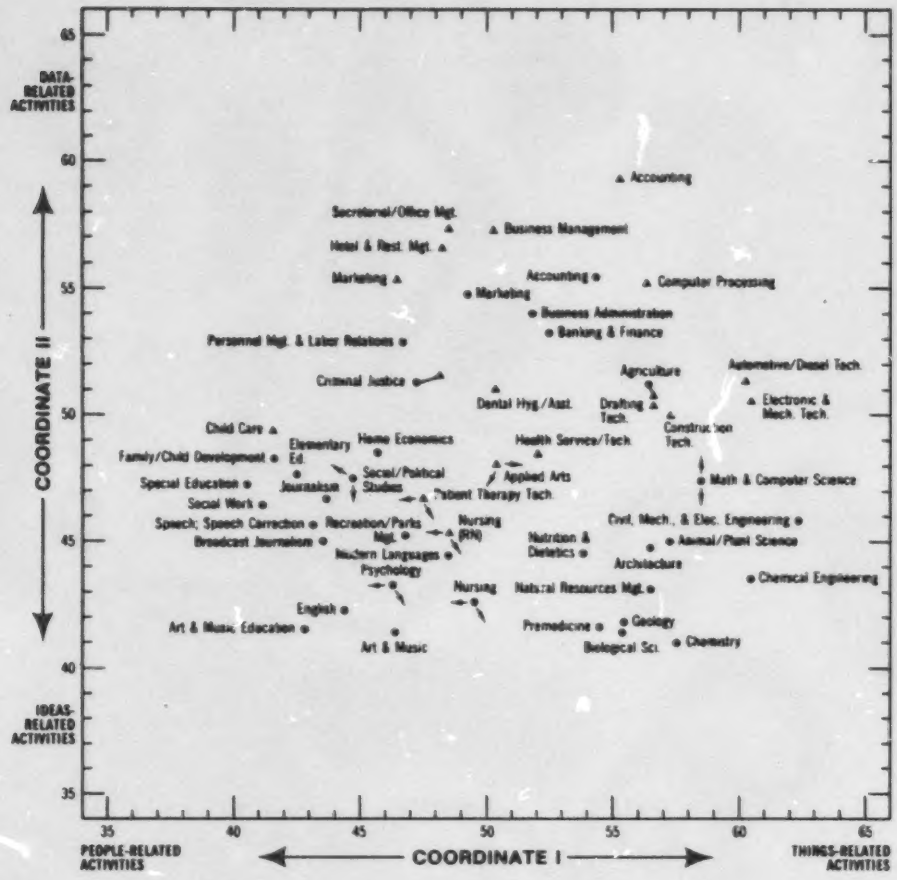


Figure 1.5. The Map of College Majors. (The • symbol represents 4-year college majors, and the ▲ symbol represents 2-year college majors.)

was developed to be appropriate for diverse populations. The broader applicability of UNIACT was achieved primarily through refinements in the item writing and selection procedure, discussed in Chapter 3.

Empirical Relationships among the Editions

The values appearing next to the connecting arrows in Figure 1.6 are median correlations between like-named scales of the different editions of the ACT Interest Inventory. As indicated with the presentation of the full set of correlations in Chapter 3, these median correlations are relatively high in comparison to the correlations obtained between like-named scales of other interest inventories assessing Holland's types. Additional empirical evidence that the various editions of the ACT Interest Inventory assess the same basic interests is provided by the results of analyses comparing the factor structure of UNIACT, the ACT-IV, and the ACT VIP-A (see Chapter 5). The structures of these different editions are nearly identical, and they are highly consistent with Holland's (1973) hexagonal model of interrelationships among basic interest types.

Finally, two studies (Lamb & Prediger, 1979) have compared the criterion-related (concurrent) validity of UNIACT and the ACT-IV. (Summaries are provided in Chapter 2.) Samples were college-bound students and college seniors, to whom both editions of the inventory were administered in a counterbalanced design. In both studies, results indicate that UNIACT and ACT-IV validity are nearly identical, both for males and for females.

In summary, all editions of the ACT Interest Inventory are based on Holland's (1973) hexagonal model. That is, they have been designed to assess the same basic interests. The empirical evidence cited above illustrates the parallel nature of the different editions. Thus, validity evidence obtained from pre-UNIACT editions of the ACT Interest Inventory should be considered, along with UNIACT data, in evaluating UNIACT validity.

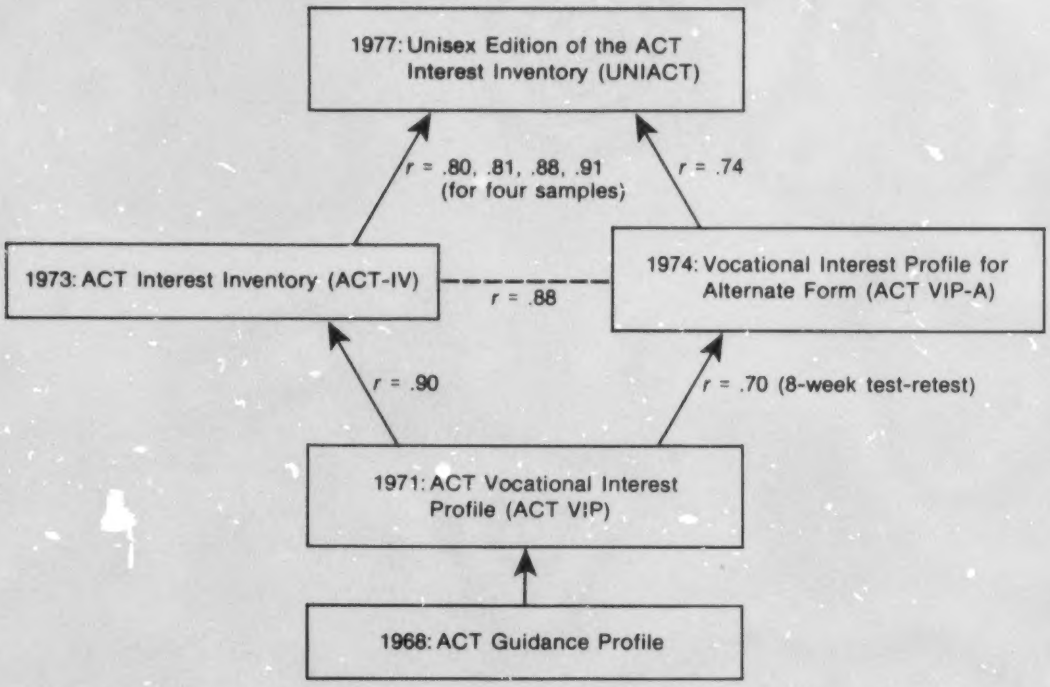

1977: Unisex Edition of the ACT Interest Inventory (UNIACT)
r = .80, .81, .88, .91 (for four samples)
r = .74
1973: ACT Interest Inventory (ACT-IV)
r = .88
1974: Vocational Interest Profile for Alternate Form (ACT VIP-A)
r = .90
r = .70 (8-week test-retest)
1971: ACT Vocational Interest Profile (ACT VIP)
1968: ACT Guidance Profile

Figure 1.6. The relationship of various editions of the ACT Interest Inventory. Values by connecting arrows are median correlations between parallel scales (see Chapter 3 for specifics).

TABLE 1.1

Scales Contained in Various Editions of the ACT Interest Inventory and Their Relation to Holland's Types

	Edition of the ACT Interest Inventory			
Holland's types	ACT VIP	ACT VIP-A	ACT-IV	UNIACT
Investigative (I)	Science	Science	Science	Science
Artistic (A)	Creative Arts	Creative Arts	Creative Arts	Creative Arts
Social (S)	Social Service	Social Service	Social Service	Social Service
Enterprising (E)	Business Contact	Business Contact	Business Contact	Business Contact
Conventional (C)	Business Detail	Business Detail	Business Detail	Business Detail
Realistic (R)	Trades, Technology	Technical	Technical	Technical
	Health[a]			
				Data/Ideas[b]
				Things/People[b]

[a]Primarily a specific combination of science and social service interests.

[b]Scales summarizing the basic dimensions underlying the hexagonal relationships among Holland's types. Summary scores on these same dimensions may also be obtained for any edition of the ACT Interest Inventory from weighted composites of the six Holland-type scales.

CHAPTER 2

RATIONALE FOR SEX-BALANCED INTEREST SCORES AND SCALES

As noted in Chapter 1, UNIACT differs from previous editions of the ACT Interest Inventory in that the item response distributions (the proportion of "like," "indifferent," or "dislike" responses to a given item) are approximately the same for males and females. The rationale for this "unisex" approach to item construction is discussed in this chapter. ACT Research Report 79 (Prediger & Johnson, 1979) provides a more extensive treatment of this topic.

The Origin of Sex-restrictive Scores

Males and females respond to many interest inventory items in characteristically different ways. For example, most males, but only a small percentage of females, say they would like to "repair an automobile," while a large number of females, but only a few males, say they would like to "care for small children." As discussed by Prediger and Johnson (1979), sex differences in responses to such items may be primarily due to sex-role connotations associated with the activities named in the items. About one-half of the items on most interest inventories show a difference of more than 15 percentage points in the "like" responses of men and women (Campbell, 1977; Hanson, Prediger, & Schussel, 1977; Johansson, 1976).

When items with male-female response differences are used to develop interest inventory scales, the distributions of raw scores obtained by males and by females are diverse and sex stereotypic. As a result, "*sex restrictive*" (Prediger & Hanson, 1974) career options are suggested to males and females. For example, Table 2.1 shows the percentages of college-bound males and females who received their highest raw score on each of the six ACT-IV scales. Eighty-eight percent of the females, but only 42% of the males, score highest on the Social Service, Creative Arts, and Business Detail Scales. In contrast, 59% of the males, but only 12% of the females, received their highest scores on the Science, Technical, and Business Contact Scales. (The data in Table 2.1 are based on raw scores, a common procedure for reporting interest inventory results. They are provided for illustrative purposes only; the ACT-IV reports standard scores based on same-sex norms.)

Incidence of Sex Restrictiveness

The male-female distributions provided in Table 2.1 are seldom available for interest inventories. Score means and standard deviations for males and females are frequently reported, however. With these data and the procedure developed by Tilton (1937), it is a simple matter to determine the degree to which the scores of males and females overlap. Table 2.2 provides illustrative data for various scales assessing Holland's (1973) six basic types of interests.

TABLE 2.1

Percentage of Males and Females Who Received Their Highest Raw Score on Each ACT-IV Scale

ACT-IV Scale	Females	Males
Science	9%	30%
Creative Arts	11	6
Social Service	67	27
Business Contact	3	10
Business Detail	10	9
Technical	0	19

Note. Data are based on the ACT-IV raw scores of 1,430 male and 2,009 female registrants for the October 1972 test date for the AAP. (Cole and Hanson, 1975). Data are shown for illustrative purposes only: Raw score reports are not provided to AAP participants.

Dunnette (1966) has suggested that two distributions differ in meaningful ways if their overlap is less than 75%. Strong (1955) proposed that "two groups that overlap less than 80 percent are different enough to be considered practically different," (p. 22). Whether or not these criteria are applied, it is readily evident from Table 2.2 that male-female score differences on certain scales are substantial. For comparison purposes, percentages of overlap for UNIACT scales are shown in the last column of Table 2.2. As discussed more fully in Chapter 4, the UNIACT overlap values meet the Dunnette and Strong criteria.

Table 2.2 and the ACT-IV distributions in Table 2.1 show that substantial discrepancies in the score response distributions of males and females are typical of traditional interest inventories reporting raw scores, (e.g., the VPI, SDS, and CDM). Similar discrepancies occur with inventories reporting standard scores based on combined-sex norms. (The SCII and CAI Theme Scales provide examples.) Since combined-sex norms merely anchor raw score scales

to parameters based on the total group of males and females, any sex differences on a raw score scale will be reflected in a scale based on combined-sex norms. Thus, as shown by Cole and Hanson (1975), standard scores based on combined-sex norms produce sex differences similar to those observed for raw scores.

When score reports are based on same-sex norms, however, males and females receive highly similar, "*sex*-balanced," interest profiles (Cole and Hanson, 1975; Gottfredson, Holland, & Gottfredson, 1975; Prediger and Hanson, 1974). This occurs because of the very nature of the norming procedure, regardless of sex differences in raw score distributions. The Kuder Preference Record—Vocational is an example of an inventory using same-sex norms.

Comparative Validity of Sex-restrictive and Sex-balanced Interest Scores

The practice of providing sex-restrictive interest inventory reports has been defended by the claim that sex-balanced scores are less valid for females than sex-restrictive scores (e.g., see Gottfredson & Holland, 1975b, 1978; Holland, 1979, p. 49). Proponents of sex-restrictive reports note that such reports more accurately predict the career choices of females than do sex-balanced reports, although differences are minimal for males. In the type of predictive validity study cited by proponents of sex-restrictive reports (e.g., see Gottfredson & Holland, 1975b), persons are assigned to criterion groups on the basis of career choice (e.g., occupation, occupational preference, college major). The interest

TABLE 2.2

Overlap of Scores for Males and Females on Various Interest Scales Assessing Holland Types

	Scales based on traditional items						
Scale	SDS[a]	VPI[b]	SCII[c]	CAI[d]	CDM[e]	ACT-IV[f]	UNIACT[g]
Investigative	77%	85%	88%	90%	91%	84%	93%
Artistic	78	77	75	77	77	76	87
Social	50	62	90	82	56	60	85
Enterprising	87	90	85	97	86	98	99
Conventional	75	94	99	74	98	95	97
Realistic	32	62	65	63	54	57	89

Note. Percent overlap is based on Dunnette's (1966) table for Tilton's (1937) measure of overlap.

[a]Data are based on Self-Directed Search (SDS) raw (summary) scores for 2,152 male and 2,431 female high school students (Gottfredson & Holland, 1975b).

[b]Data are based on Vocational Preference Inventory (VPI) raw scores for 6,290 male and 6,143 female entering college students (Holland, 1975, p. 29).

[c]Data are based on Strong-Campbell Interest Inventory (SCII) Theme Scales standard scores for 300 males and 300 females in the men- and women-in-general samples (Campbell, 1977, p. 33).

[d]Data are based on Career Assessment Inventory (CAI) Theme Scale standard scores for a "composite reference sample" of 750 males and 750 females (Johansson, 1976, p. 23). This sample was used to select a subset of CAI items that minimized theme scale sex differences (Johansson, 1976, p. 20).

[e]Data are based on Harrington/O'Shea System for Career Decision Making (CDM) raw scores for 435 male and 380 female high school and college students (Harrington & O'Shea, 1976, p. 9).

[f]Data are based on ACT Interest Inventory (ACT-IV) raw scores for the 1,233 males and 1,736 females in the ACT-IV national norm group for college-bound persons (Hanson, 1974, p. 14). These data are for purposes of comparison only. Standard scores based on same-sex norms were used in ACT-IV score reports (Hanson, 1974).

[g]Data are based on the UNIACT raw scores of 1,247 males and 1,693 females in the UNIACT national norm group.

scale with the highest score (high-point code) provides a person's predicted career choice. The prediction is termed a "hit" if a person's high-point code corresponds to the person's criterion group (both are Artistic, for example). The indicator of overall validity is the percentage of correct predictions (i.e., the "hit rate") across all criterion groups.

Although sex-restrictive reports generally produce higher hit rates for females, it has been noted that few, if any, counselors use interest inventories to predict career choices (Berdie, 1970; Prediger, 1977). If counselors were interested in literally predicting a counselee's future choice they would be more successful for both males and females by simply basing their predictions on current stated choice (Borgen & Seling, 1978; Gottfredson & Holland, 1975b; Holland, 1973; Touchton & Magoon, 1977), or, in the case of females, by predicting "social" for everyone (Gottfredson & Holland, 1975b).

Prediger (1977) has proposed a different model for determining interest inventory hit rates—a model that is consistent with the typical reason for using an interest inventory in counseling (i.e., to identify personally relevant career options). This model, which is described and extended in the "Quantitative Summaries" section of Chapter 6, examines the degree to which individuals classified into each of the various criterion groups (on the basis of occupation, academic major, etc.) would have been referred to their group as a result of their interest inventory scores. Concurrent or longitudinal data can be used in the model to determine an inventory's criterion-related or construct validity (most analyses bear on both types).

The counseling-oriented validation model described above is closely related to a central principle in Holland's (1973) theory of careers (and other theories). As noted in Chapter 1, Holland classifies interests and occupations into six types: Realistic (R), Investigative (I), Artistic (A), Social (S), Enterprising (E), and Conventional (C). According to Holland's theory, Investigative (I-type) interests should predominate among persons choosing I-type occupations, Enterprising (E-type) interests should predominate among persons choosing E-type occupations, and so on. As suggested by Holland (1973), predominant interests can be defined as the most frequent high-point code (p. 3) or the highest mean score (p. 21) for a criterion group.

The results of 14 counseling-oriented validity studies comparing sex-restrictive and sex-balanced reporting procedures are summarized in Table 2.3. Included are concurrent and longitudinal data involving a variety of criterion groups and instruments. The results for both criterion-related and construct validity studies (using the counseling-oriented validation model) indicate that, for both sexes, the validity of sex-balanced interest reports is at least as high as that of sex-restrictive reports. In most instances, it is higher.

The last study listed in Table 2.3 (Prediger, 1980b) provides a meta-analysis of the results of six previous studies. Fifty female criterion groups were represented, with a total *N* of over 9,000. The groups (each of which included individuals of a single Holland type) consisted of employed adults (26 groups), college seniors (12 groups), college-bound students (6 groups), and a mixed sample of first- and third-year college students (6 groups). For 26 of the groups, interest scores were obtained with the SDS; scores for the remaining 24 groups were obtained with the ACT Interest Inventory. Predominant interests corresponded with a criterion group's Holland type in 25 instances (50%) with sex-restrictive reports, and in 40 instances (80%) with sex-balanced reports. Thus, the use of sex-balanced scores resulted in a 60% increase in the number of criterion groups (25 vs. 40) with appropriate interest scores. Correspondence between predominant interests and each criterion group type was as follows for normed scores (raw scores in parentheses)—R: 6(0); I: 7(5); A: 6(5); S: 4(8); E: 9(1); and C: 8(6).

Numerous other studies provide support for sex-balanced reports. High point codes based on ACT Interest Inventory scores of over 40,000 persons in 352 educational and occupational criterion groups are presented in Appendix C. The codes for males and females are generally congruent with expectations based on Holland's theory of careers, demonstrating that persons in a wide range of criterion groups obtain sensible score profiles when sex-balanced reports are used. A study by Lamb (1978), summarized in Chapter 8, indicates that sex-balanced score reports are appropriate for use with males and females in various minority groups.

Sex-balanced (Unisex) Scales as an Alternative

The data presented thus far support use of sex-balanced interest reports based on same-sex norms as a viable alternative to sex-restrictive reports. Another approach, the one taken in UNIACT development, is to eliminate sex differences at the item level, thus producing "unisex scales" consisting of sex-balanced items (Rayman, 1976). Since males and females obtain similar distributions of scores on these scales, combined-sex norms can be used to obtain sex-balanced reports. Same-sex norms, which may be viewed as "treating males and females differently," are not necessary. In addition, sex-balanced items are in accord with the National Institute of Education's Guidelines for Assessment of Sex Bias and Sex Fairness in Career Interest Inventories (Diamond, 1975). (UNIACT's overall compliance with the NIE Guidelines and Title IX of the Educational Amendments of 1972, is described in Appendix G.)

As noted in Chapter 1 and described in detail in Chapter 3, UNIACT items were chosen to assess basic vocational interests while minimizing sex-role connotations. Prediger and Hanson (1978) note that "This approach to interest scale construction recognizes that sex differences in the responses to many interest items may reflect the differential effects of sex-role socialization on males and females without necessarily reflecting differences in basic interests. Thus, groups of males and females may respond quite differently to interest inventory items with sex-role connotations . . . even though the groups may have similar patterns of interest" (p. 89).

Direct evidence of the effectiveness of the unisex scale alternative to interest scale construction is provided by studies comparing the validity of unisex and traditional

TABLE 2.3

Summary of Validity Data for Sex-restrictive and Sex-balanced Score Reports of Holland Types

Study	Type of validity	Time interval	Sample; No. of males (M) & females (F)	Criterion; No. of criterion groups	Relative performance of sex-balanced reports (SBR) & sex-restrictive reports (SRR)
Prediger & Hanson (1976)	Construct	Concurrent & longitudinal (5 years)	Young adults & adults in 3 samples; M=20,000, F=19,000	Occ. status (2 samples) & preference; M=104, F=104	SBR more in agreement with congruency principle and occupational typology in Holland's theory of careers
Prediger (1976a)	Construct	Concurrent	High school & college students & adults in 7 samples; M=18,000, F=20,000	NA	SBR more in agreement with consistency principle in Holland's theory of careers
Prediger & Hanson (1977)	Criterion-related	Concurrent	College seniors; M=5,500, F=5,000	College major; M=5, F=5 (by Holland type)	SBR and SRR hit rates similar[a] for males; SBR better for females
Hanson, Noeth, & Prediger (1977)	Criterion-related	Longitudinal (5 years)	Young adults; M=648, F=425	Occ. status; M=6, F=5 (by Holland type)	SBR hit rate better for males and females
Hanson, Noeth, & Prediger (1977)	Criterion-related	Longitudinal (2 years)	College sophomores; M=549, F=894	College major; M=5, F=5 (by Holland type)	SBR and SRR hit rates similar for males; SBR better for females
Prediger (1977)	Criterion-related	Longitudinal (1 to 3 years)	College freshmen & juniors; F=989	Occ. preference; F=5 (by Holland type)	SBR and SRR hit rates similar for females; SBR data not available for males
Lamb & Prediger (1979)	Criterion-related; construct	Concurrent	College seniors; M=929, F=1,033	College major; M=6, F=6 (by Holland type)	SBR and SRR hit rates similar for males and for females; SBR and SRR match between predominant interests and criterion group status similar for males and for females
Lamb & Prediger (1979)	Criterion-related; construct	Concurrent	College-bound students; M=737, F=852	Occ. preference; M=6, F=6 (by Holland type)	SBR and SRR hit rates similar for males and for females; SBR and SRR match between predominant interests and criterion group status similar for males; SBR better for females
Prediger & Lamb (1979)	Criterion-related; construct	Concurrent	College alumni; M=696, F=405	Occ. status; M=6, F=6	SBR and SRR hit rates similar for males and for females; SBR and SRR match between predominant interests and criterion group status similar for males; SBR better for females
Prediger (1980a)	Construct	Concurrent	Adults; M=289, F=428	Occ. status; M=14, F=20 (by Holland type)	SBR and SRR match between predominant interests and criterion group status similar for males; SBR better for females
Lamb & Prediger (1980)	Construct	Concurrent	College seniors; M=4,416, F=4,191	College major; M=15, F=15	SBR more in agreement with congruency principle and occupational typology in Holland's theory of careers
Lamb & Prediger (1980)	Construct	Longitudinal (4 years)	College seniors; M=3,637, F=3,203	College major; M=36, F=36	SBR more in agreement with congruency principle and occupational typology in Holland's theory of careers
Prediger & Lamb (in press)	Criterion-related; construct	Longitudinal (4 years)	College seniors; M=5,846, F=5,549	College major; M=6, F=6 (by Holland type)	SBR and SRR hit rates similar for males and for females; SBR and SRR match between predominant interests and criterion group status similar for males; SBR better for females
Prediger (1980b)	Construct	Concurrent & longitudinal (1 to 4 years)	College freshmen, seniors and adults; F=9,256	Occ. status, F=26; and preference, F=12; college major, F=12 (all by Holland type)	SBR match between predominant interests and criterion group status 60% better for females

Note. Sex-balanced reports (SBR) based on same-sex norms are compared with sex-restrictive reports (SRR) based on raw scores for the same interest inventory. All studies involved traditional interest items assessing Holland's six types.

[a]When SBR and SRR criterion group hit rates differed by less than 5% (e.g., 46% vs. 42%), they were considered to be similar.

interest scales reporting scores based on same-sex norms. For example, Hanson and Rayman (1976) compared the criterion-related validity of a prototype unisex interest inventory with that of the ACT-IV, for which about 60% of the items are not sex balanced. Both interest inventories assessed the same interests. The sample consisted of 582 male and 878 female college-bound students classified according to Holland type on the basis of occupational preference. Validities of high-point codes were similar for the two instruments.

Additional evidence is provided in two studies reported by Lamb and Prediger (1979). In both studies, the criterion-related validities of UNIACT and the ACT-IV were compared. The sample in the first study consisted of 737 male and 852 female college-bound students classified according to Holland type on the basis of occupational preference. Participants in the second study were 929 male and 1,033 female college seniors classified on the basis of college major. In both studies, for both sexes, the counseling-oriented validities of UNIACT and the ACT-IV were similar. Other types of validity evidence presented in later chapters of this report (e.g., conformity of scale structure to the hexagonal model proposed by Holland, 1973) also indicate that unisex scales are a viable alternative for providing sex-balanced reports.

Summary of Results

As noted above, sex-restrictive interest reports suggest dissimilar and sex-stereotypic career options to males and females. In contrast, sex-balanced reports suggest similar career options. Comparisons indicate that the validity of sex-balanced reports is equal to and often higher than that of sex-restrictive reports when counseling uses of interest inventories are considered. Comparisons of two procedures for generating sex-balanced reports—the use of same-sex norms with traditional interest scales, and the construction of unisex interest scales—indicate comparable validity.

CHAPTER 3

UNIACT DEVELOPMENT AND NORMING

In contrast to the previous editions of the ACT Interest Inventory, UNIACT was developed with the goals of achieving a high degree of sex balance at the item level and providing scales appropriate for diverse populations. This chapter describes the techniques employed to attain these goals. ACT Research Report 78 (Hanson, Prediger, & Schussel, 1977) and the VIESA handbook (ACT, 1976) provide a more complete discussion.

Overview of Item Development Procedures

Studies by Boyd (1976), Gottfredson (1976), and Holland and Gottfredson (1976) show that simply "desexing" existing interest inventory items (e.g., changing "policeman" to "police officer") has little effect on scale scores. However, no attempt was made in those studies to write and pretest new items endorsed in equal proportions by males and females. Rayman (1976), working with Hanson and Cole at ACT, demonstrated the viability of this latter approach to interest scale construction. As noted in Chapter 2, Hanson and Rayman (1976) showed that Rayman's "unisex scales" had criterion-related validity equivalent to that of traditional, sex-restrictive scales administered to the same sample.

Encouraged by these results and the related work of Lunneborg (1977), staff members at ACT conducted a series of studies leading to the development of UNIACT. Development began with a substantial pool of sex-balanced items already used in various editions of the ACT Interest Inventory. (As noted in Chapter 2, about half of the items on traditional interest inventories are reasonably sex balanced.) Added to this pool were additional items written to capture the essence of various work-related activities, while minimizing sex-role connotations. As described below, item analysis data for six different samples (including over 10,000 9th graders, 11th graders, college-bound students, and adults) were studied in determining and cross-checking item characteristics. More than 200 potentially sex-balanced items, many of which underwent repeated tryouts, were administered to these samples.

An overview of the samples used for the item tryout and validation studies is provided in Table 3.1. Hereafter, these samples will be referred to by letter designation (e.g., Sample A, B, C, etc.). For all samples except Sample B, potentially sex-balanced items were administered concurrently with the ACT-IV (or the ACT VIP-A); for Sample B, the items were administered within 8 weeks after students completed the ACT-IV.

There were three more or less distinct stages of scale development. The first involved Samples A and B, the second Samples C and D, and the third Samples E and F. Samples B, C, E, and F were each randomly subdivided into an item analysis sample and a holdout (cross-validation) sample. Items selected on the basis of results from the item analysis samples were scored on the appropriate UNIACT preliminary scales for the holdout samples. The resulting scale means and frequency distributions were checked for overall sex balance. Scale intercorrelations were also examined.

At each stage of scale development, item selection and refinement were determined by the degree of balance in the percentage of "like" responses for males and females and by the correlation of items with the various ACT-IV scales. Items which showed a 10% or smaller difference in the percentages of "like" responses and which correlated with the appropriate scales were retained for subsequent tryouts.

For Samples C, D, E, and F, potentially sex-balanced items were also correlated with data/ideas and things/people dimension scores. These scores were obtained by multiplying the six ACT-IV scale scores by weights derived from expectations based on Holland's hexagonal model. (See Figure 1.1 and the discussion of UNIACT scale structure in Chapter 5.) Item-dimension correlations were considered together with the data cited above in screening the item pool for effective items.

Data from the item analysis subsamples of Samples E and F were used in making final refinements. The final scales assessing Holland's types consist of 90 items (15 items per scale). Of these 90 items, 60 are also used in the Data/Ideas and Things/People Summary Scales. The items are listed in Appendix D, and Appendix E provides scoring instructions.

UNIACT Item Characteristics

Unless otherwise noted, all analyses reported in this section and the sections that follow were conducted on a sample of 1,851 (914 males and 937 females) obtained by combining the holdout groups from Samples E and F.

Scale Homogeneity

Each UNIACT item was correlated, separately by sex, with the six UNIACT scale scores. If the items constituting each scale are homogeneous, the correlations of those items with the total score for that scale should be substantially higher than the correlations with the total score for any other scale. Since the correlation of an item with its own scale is probably an overestimate (because the item is part of the

total score for that scale), the 90 UNIACT items were also correlated with scores from the ACT-IV scales.

The median correlations between items in a UNIACT scale and each of the UNIACT and ACT-IV scale scores are shown in Table 3.2 for males and Table 3.3 for females. For all scales for both males and females, the median correlation between an item and its own UNIACT scale was considerably higher than the median correlations between the items and the scores of the other scales. For example, the median correlation of the Business Contact items with the UNIACT Business Contact score is .57 for males and .51 for females. The next highest correlations are with the Social Service Scale (.39 for males and .28 for females) and the Business Detail Scale (.36 for males and .26 for females), which are adjacent to Business Contact on Holland's (1973) hexagonal model. This pattern of correlations generally held for items in the other scales as well. In addition, the same pattern was found when items in each UNIACT scale were correlated with the six ACT-IV scores (also shown in Tables 3.2 and 3.3). As expected, the magnitude of the own-scale correlations is somewhat lower.

Given the restricted range of the item response scale (options are "like," "indifferent," and "dislike"), these item-total correlations are relatively high and suggest that the goal of constructing homogeneous sets of items for each scale was met. Additional evidence regarding the homogeneity of the scales is provided by the internal consistency estimates of reliability presented in Chapter 4.

Sex Differences in Item Responses

A major goal in constructing UNIACT scales was to eliminate large sex differences in responses to individual items. With only a few exceptions (most of which were for

TABLE 3.1

Description of UNIACT Item Tryout Samples

Sample	*N*	Percent females	Educational level	Nature of sample
A	1,625	63	Grade 14	A sample of college sophomores who responded to a follow-up survey of ACT-IV national norm group (Hanson, 1974).
B				
Item Analysis	1,191	59	Mostly grade 12	A nationally representative sample of ACT-tested college-bound students. Sample was obtained by taking every 65th student from the October 1975 national test date. Sample was randomly divided into item analysis and holdout groups.
Holdout	1,191	58		
C				
Item Analysis	1,123	49	Grade 9	Sample obtained from 10 rural, small city, and suburban high schools in Iowa and Missouri. Sample was randomly divided into item analysis and holdout groups.
Holdout	725	50		
D	1,250	29	Community college adults	Students 25 years and older enrolled in degree-oriented programs in 10 community colleges in 7 states.
E				
Item Analysis	1,031	43	Grade 11	Eleven schools selected from the 200 that participated in the national norming of the lower-level ACT CPP Career Planning Program, (ACT, 1974). Schools were in rural, medium city, large city, and suburban locations in 11 states.
Holdout	1,031	45		
F				
Item Analysis	201	50	Grade 11	Five schools chosen in a manner similar to Sample.E. Schools were in five states and rural, urban, and suburban settings.
Holdout	820	57		
Total	10,388			

TABLE 3.2

Median Correlations between UNIACT Items and UNIACT and ACT-IV Total Scale Scores for Males

UNIACT scales	UNIACT and ACT-IV scales					
	Science	Creative Arts	Social Service	Business Contact	Business Detail	Technical
Science	72(60)	23(18)	26(23)	13(10)	15(13)	13(15)
Creative Arts	21(14)	60(48)	25(22)	16(16)	10(10)	13(12)
Social Service	22(20)	23(23)	59(44)	37(35)	24(24)	11(08)
Business Contact	11(11)	17(12)	39(28)	57(47)	36(34)	18(14)
Business Detail	12(14)	07(03)	28(20)	40(35)	65(51)	25(21)
Technical	09(07)	14(15)	14(13)	19(17)	21(19)	56(35)

Note. Sample based on 914 males (holdout subgroups of Samples E and F) as described in text. Values shown are the median correlations (decimals omitted) between the items on each UNIACT scale and the UNIACT total scale scores (ACT-IV in parentheses). Underlined values indicate the median correlation between an item set and the corresponding total scale score.

TABLE 3.3

Median Correlations between UNIACT Items and UNIACT and ACT-IV Total Scale Scores for Females

UNIACT scales	UNIACT and ACT-IV scales					
	Science	Creative Arts	Social Service	Business Contact	Business Detail	Technical
Science	68(57)	18(16)	23(15)	06(03)	04(00)	23(23)
Creative Arts	16(15)	62(47)	25(15)	19(15)	-03(-02)	23(21)
Social Service	17(20)	20(19)	51(35)	23(26)	08(07)	14(15)
Business Contact	05(05)	16(12)	28(17)	51(38)	26(21)	13(14)
Business Detail	00(03)	-04(-06)	08(07)	33(25)	66(50)	19(17)
Technical	17(18)	16(16)	13(12)	15(12)	15(11)	55(40)

Note. Sample based on 937 females (holdout subgroups of Samples E and F) as described in text. Values shown are the median correlations (decimals omitted) between the items on each UNIACT scale and the UNIACT total scale scores (ACT-IV in parentheses). Underlined values indicate the median correlation between an item set and the corresponding total scale score.

the Social Service Scale), items were retained for a scale if the difference in the percentage of "like" responses for males and females was 10% or less. This criterion is somewhat more conservative than that used by Campbell (1977), who suggested a 15% cutoff. Examples of sex-balanced items selected for UNIACT, as well as sex-restrictive ACT-IV items which were not, are shown in Table 3.4.

A summary of sex differences in the percentage of "like" responses is provided in Table 3.5. The average difference (mean of the absolute differences) between males and females ranges from 4.1 for the Business Contact Scale to 12.3 for the Social Service Scale. Five of the six scales have an average difference of less than 10%; in four of the six scales, at least 13 of the 15 items have less than 10% difference in the percentage of "like" responses. The Social Service Scale is the least sex-balanced, although the average difference (12.3) is still less than the 15% which Campbell (1977) suggests as a criterion for a meaningful difference. Overall, 80% of the UNIACT items are sex-balanced when a 10% difference is used to define balance. Of the remaining items, 61% are answered "like" more frequently by females than by males. Across the total item pool, 60% of the items are answered "like" more frequently by females.

As shown in Table 3.5, the degree of sex balance in UNIACT items is a substantial improvement over that of ACT-IV items. For example, only one item on the ACT-IV Social Service Scale and three items on the ACT-IV Technical Scale are sex-balanced. Across all the ACT-IV scales, only 38% of the items meet the 10% criterion for sex balance. Additional evidence regarding the degree of UNIACT sex balance at the scale level is presented in Chapter 4.

Age-Sex Differences in Item Responses

UNIACT was intended for use in a variety of settings and with individuals of a wide range of ages. Intuitively, one might expect differences in the preferences of the sexes for work-related activities to increase with age due to longer exposure to sex-stereotyped attitudes prevalent in our culture. Because of differential length of exposure to such sex-stereotyped attitudes, sex balance obtained for one age group might not hold for older or younger age groups. As part of the development of the UNIACT, a preliminary version was administered to three different age samples: 9th graders (Sample C); 12th graders (Sample B); and adult community college students who were age 25 or older (Sample D). The item pool for this preliminary version contained 71 items that were eventually included in the final form of UNIACT. Items from all six of the final scales were included, although there were fewer items from the Social Service and Technical Scales than from any of the other four scales.

A summary of the item sex balance across the three different age samples is provided in Table 3.6. The average difference (mean of the absolute differences) between males and females in the percentage of "like" responses to these 71 items is nearly identical for the three age groups. In addition, about 60 (84%) of these items show a 10% or smaller difference in the percentage of "like" responses for each of the three age groups. These data suggest that the degree of sex balance in UNIACT items is relatively constant across a wide range of ages.

Correlations with Previous Editions of the ACT Interest Inventory

To the degree that sex role expectations affect the scores on interest inventories, irrelevant variance is included (unless, of course, one's purpose is to assess sex-stereotypic attitudes toward various types of work-related activities). Because response distributions to UNIACT items are similar for males and females, the items should be less subject than

TABLE 3.4

Examples of Items Selected and Rejected for Inclusion in UNIACT on the Basis of Sex Balance

	% Answering "like"		Correlation with scale score	
Examples of items[a]	M	F	M	F
Sex-balanced items (selected)				
Technical (Realistic) Scale				
1. Pump gas in a service station	26	20	56	58
2. Fix a toy	39	40	57	58
Social Service (Social) Scale				
3. Help rescue someone in danger	69	73	58	51
4. Explain legal and civil rights to people	30	30	60	48
Sex-restrictive items (rejected)				
Technical (Realistic) Scale				
1. Repairing an automobile	52	13	65	62
2. Operating a power tool	40	7	71	63
Social Service (Social) Scale				
3. Taking care of babies or very small children	18	76	59	47
4. Working for the Red Cross	28	61	56	46

Note. Data for the sex-restrictive items are based on the ACT-IV norm group sample of 2,009 women and 1,430 men, as described by Hanson (1974). Decimals have been omitted from item-scale correlations.

[a]Holland (1973) types corresponding to UNIACT scale titles are shown in parentheses.

TABLE 3.5

Sex Differences in UNIACT and ACT-IV Item Responses

Item characteristics	UNIACT (and ACT-IV) scales					
	Science	Creative Arts	Social Service	Business Contact	Business Detail	Technical
Mean of absolute difference between males and females in the percentages of "like" responses	5.3(13.1)	6.2(15.7)	12.3(25.4)	4.1(8.7)	4.9(11.4)	8.7(22.9)
Number of items with a sex difference of 10% or less in the percentage of "like" responses	13(5)	14(6)	7(1)	14(11)	14(8)	10(3)

Note. Sample is based on 937 females and 914 males (holdout subgroups of Samples E and F) completing the six 15-item scales of the UNIACT. Values reported in parentheses are based on the ACT-IV data provided by Hanson (1974).

the other editions of the ACT Interest Inventory to stereotypic reactions to the object or nature of the activity described. Thus, even though UNIACT and the other editions were designed to measure the same interest dimensions, the relationship between corresponding scales might be attenuated.

Correlations between UNIACT and ACT-IV scales are shown in Table 3.7 for a sample of 737 male and 852 female college-bound high school seniors (described by Lamb & Prediger, 1979). Participants were administered both instruments concurrently, with half of the sample receiving forms with ACT-IV items printed first, and the other half receiving forms with UNIACT items printed first. For the same-named scales, correlations range from .84 to .95 (median of .91) for males, and from .80 to .94 (median of .91) for females.

The above correlations between same-named UNIACT and ACT-IV scales are listed in Table 3.8, along with corresponding correlations for samples of 11th graders, college juniors, and college seniors. Median correlations for these latter three samples (presented separately by sex, except for the 11th graders) range from .80 to .88. Also shown in Table 3.8 are correlations between like-named scales of UNIACT and the ACT VIP-A (median of .74); the ACT-IV with the ACT VIP-A (median of .88 for both sexes); and the ACT-IV with the ACT VIP (median of .89 and .90 for males and females, respectively). Not shown in Table 3.8, because data were obtained with an 8-week interval between test administrations, are correlations between like-named scales of the ACT VIP and the ACT VIP-A. For the sample of 334 11th graders (ACT, 1974, pp. 33-36), these values range from .52 to .74 (median of .70).

Perspective on the magnitude of the correlations shown in Table 3.5 can be gained by comparing correlations reported for the Vocational Preference Inventory (VPI) and Self-Directed Search (SDS), instruments developed by Holland to assess his six types (Holland, 1973). Holland (1979) reports VPI-SDS correlations for same-named scales ranging from .20 to .54 (median of .43) for 347 college women and from .50 to .65 (median of .55) for 344 college men. The UNIACT correlations reported in Table 3.8 are quite high by comparison, especially since the VPI is one of the four components contributing to SDS scores.

TABLE 3.6

Sex Differences in UNIACT Item Responses for Three Diverse Age Groups

Item characteristics	Age groups		
	Adults[a]	Grade 12[b]	Grade 9[c]
Mean of absolute difference between males and females	6.3%	6.1%	6.2%
Number of items with a sex difference of 10% or less in the percentage of "like" responses	59	60	59

Note. Data are based on 71 items common to the item pools administered to the three age groups and included in the final form of the UNIACT.

[a]Based on 1,250 community college adults in Sample D.

[b]Based on 1,191 12th graders from holdout subgroup of Sample B.

[c]Based on 725 9th graders from holdout subgroup of Sample C.

UNIACT Norms

As mentioned earlier, UNIACT is presently a component of two ACT programs: the ACT Assessment Program (AAP),

TABLE 3.7

Correlations of UNIACT Scales with ACT-IV Scales

	UNIACT scales							
ACT-IV scales	Science	Creative Arts	Social Service	Business Contact	Business Detail	Technical	Mean	*SD*
Science	91(92)	29(31)	22(23)	01(03)	06(03)	25(32)	2.0(1.9)	.7(.7)
Creative Arts	31(32)	92(94)	47(40)	20(32)	-08(-08)	23(31)	1.9(2.2)	.6(.6)
Social Service	19(19)	43(29)	87(80)	48(43)	16(14)	30(26)	2.1(2.5)	.5(.5)
Business Contact	-07(-06)	19(25)	52(52)	91(90)	53(45)	24(25)	2.0(2.1)	.6(.5)
Business Detail	05(00)	-03(-04)	19(16)	53(49)	95(94)	29(27)	1.0(2.0)	.6(.6)
Technical	40(46)	21(34)	13(22)	15(25)	27(32)	84(83)	2.0(1.6)	.5(.5)
Mean	2.1(2.0)	2.0(2.2)	2.2(2.4)	2.1(2.1)	2.0(2.1)	1.8(1.7)		
SD	.7(.7)	.6(.6)	.5(.4)	.5(.5)	.6(.6)	.5(.5)		

Note. Data are based on a sample (described by Lamb & Prediger, 1979) of 737 males and 852 females who had registered to take the ACT Assessment Program on the October 1977 national test date. Values for females are shown in parentheses. Means and standard deviations are expressed in raw score (average item response) units.

intended for college-bound students, and the Vocational Interest, Experience, and Skill Assessment (VIESA), intended for use in grades 8-12. The development of norms for each of these programs is described in this section.

ACT Assessment Program Norms

As discussed in Chapter 2, combined-sex norms are used with UNIACT. In developing norms for the AAP, average UNIACT item scores (the total scale score divided by the number of items answered) for the norms sample were assigned to a *T*-score scale (mean of 50 and a standard deviation of 10). Because an area transformation (Guilford, 1964, p. 521) was used for scaling, the *T*-scores (standard scores) correspond to approximately the same percentile ranks across all scales. Hence, a standard score of 60 has a percentile rank of approximately 84 for all scales. The results of the scaling (the norms tables) are shown in Appendix E.

UNIACT replaced the ACT-IV as a component of the AAP beginning with the 1977-78 academic year. Interim norms were used that year. The interim norms group consisted of 1,297 males and 1,788 females randomly selected from approximately 127,000 registrants for the first (October) AAP national test date. (Although all 127,000 persons could have been included in the norms sample, a random sample of about 3,000 provided adequate precision for developing norms and considerably simplified the data processing requirements.) The decision to use the interim norms sample for the entire 1977-78 processing year was made following various analyses to determine whether October registrants differed from AAP registrants in general with respect to various demographic characteristics and career choices. No important differences were found.

Final norms were developed from a random sample of 1,247 males and 1,693 females drawn from the approximately 198,000 persons who registered for the November 1977 AAP national test date. From a sampling standpoint, there was no advantage to basing norms on the November rather than the October samples. However, for reasons related to the mechanics of score report processing, it was not possible to obtain item response data for the October sample. Since these data were needed in order to compute UNIACT internal consistency reliability estimates for the norms sample, final UNIACT norms were based on the November sample.

Characteristics of the norms sample, as determined from responses members provided to questions in the AAP registration folder, are provided in Tables 3.9 and 3.10. Compared to the U.S. population, members from the Midwest were overrepresented (32% of the total sample), and members from the West (6%) and the East (13%) were underrepresented. Females constituted 58% of the sample. Seventy-four percent of the individuals were White, 8% were Black, and 12% indicated that they were either members of other minority groups or that they preferred not to respond. Approximately 89% reported aspiring to earn at least a bachelor's degree. Because the sample consisted of individuals who chose a test date early in the academic year, 89% were high school seniors and only 2% were juniors. (Most juniors participate in the AAP at later test dates.)

TABLE 3.8

Correlations between Like-named Scales of Different Editions of the ACT Interest Inventory

Scale	UNIACT with ACT-IV										
	Eleventh graders[a]	College-bound students[b]		College juniors[c]		College seniors[d]		UNIACT with ACT VIP-A[e]	ACT-IV with ACT VIP-A[f]		ACT-IV with ACT VIP[f]	
		M	F	M	F	M	F		M	F	M	F
Science	86	91	92	87	87	88	87	81	90	93	89	91
Creative Arts	82	92	94	82	81	92	90	72	87	89	90	91
Social Service	78	87	80	74	62	79	78	72	89	86	90	90
Business Contact	78	91	90	82	78	89	88	74	90	88	89	90
Business Detail	84	95	94	88	84	89	91	74	87	87	88	89
Technical	76	84	83	76	75	71	75	74	81	87	78	85
Median *r*	80	91	91	82	80	88	88	74	88	88	89	90
N	1,031	737	852	186	262	929	1,033	820	426	391	361	389

Note. In all studies, test forms were administered concurrently. Half of the sample received items of one form first, and the other half of the sample received items of the other form first. Decimals are omitted.

[a] Holdout subgroup of Sample E.

[b] High school seniors who registered for the October 1977 national test date (Lamb & Prediger, 1979).

[c] Juniors at a midwestern university (Michal, 1979).

[d] Seniors at 16 universities in 15 states (Lamb & Prediger, 1979).

[e] Holdout subgroup of Sample F.

[f] High school seniors in 7 Iowa communities.

Evidence that the UNIACT norms distributions are not appreciably different from the distributions of all AAP participants is provided in Table 3.11. Shown are means and standard deviations for the November 1977 norms sample and a sample of AAP participants tested in 1978-79, the first year the permanent norms were used. The AAP sample consisted of 10% of all 1978-79 participants who (a) were enrolled in high school and (b) were tested on a national test date. For 16 of the 18 comparisons (performed separately by sex and for both sexes combined) the corresponding means and standard deviations for the norms sample and the 10% sample are within one *T*-score unit (mean of 50, S.D. of 10) of each other. Differences in the two exceptions are less than 1.5 *T*-score units. The mean absolute difference across the 18 comparisons is .54 units.

VIESA Norms

UNIACT norms for VIESA are based on a 10% random sample of the 4,623 male and 4,684 female 11th graders in a nationally representative sample of approximately 32,000 students in grades 8, 9, and 11. The students were enrolled in 200 schools selected according to region of the country, size and socioeconomic status of the community, and size of the school. The target population for the norming study was defined as all full-time 8th, 9th, and 11th grade students enrolled in public or Catholic schools in the United States in the spring of 1973. A two-stage probability sample of schools was selected by Research Triangle Institute using sampling frame data developed for the National Assessment of Educational Progress. First, primary sampling units (PSUs) were selected from a frame consisting of a list of counties or groups of contiguous counties stratified by region, size of community, and socioeconomic status. Within each sample PSU, one sample of schools for each of grades 8, 9, and 11 was independently selected, with probability proportional to the grade enrollment of the school. Bayless, Bergsten, and Noeth (1974) provide a description of the norming procedures; the handbook for the lower-level ACT CPP (ACT, 1974) summarizes the procedures.

TABLE 3.9

Percentage of the UNIACT AAP Norms Sample from Each Geographic Region

Region	Component states	Percentage in region
Western	Alaska, California, Hawaii, Idaho, Nevada, Oregon, Washington	6
Mountain/ Plains	Colorado, Kansas, Montana, Nebraska, North Dakota, South Dakota, Utah, Wyoming	15
Southwestern	Arizona, Arkansas, New Mexico, Oklahoma, Texas	16
Midwestern	Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, Wisconsin	32
Southeastern	Alabama, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia	18
Eastern	Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, West Virginia	13

TABLE 3.10

Sex, Race, Grade Level, and Degree Aspirations of the UNIACT AAP Norms Sample

	Percentage of sample
Sex	
Males	42
Females	58
Race	
Afro-American/Black	8
American Indian	2
Caucasian-American	74
Spanish American[a]	3
Asian American/Pacific Islander	1
Other/prefer not to respond	11
Grade level when tested	
11th grade	2
12th grade	89
High school graduate	4
College student	2
Other	3
Degree aspirations	
Voc/Tech program (less than 2 years)	3
Two-year college degree	13
Bachelor's degree	40
One or two years of graduate study	15
Professional level degree	21
Other	4

[a]Includes the categories "Mexican American or Chicano" and "Puerto Rican or Spanish-speaking American."

Analyses of interest scores for the norms sample indicated that there were only slight differences in overall means and standard deviations across grades 8, 9, and 11 (ACT, 1974). These results and related data indicated that, despite possible shifts in the interests of individual students, norms distributions based on all students in a grade were essentially the same across the grades. The similarity in the interest norms for grades 8, 9, and 11 indicated that, for practical purposes, a single set of norms could be used for VIESA. This meant that the norms look-up process could be simplified, thereby making self-scoring easier. Grade 11 norms were arbitrarily chosen to transform UNIACT raw scores into World-of-Work Map regions, though norms based on either of the other two grades would have provided essentially the same results.

Since individuals in the norms sample took the ACT VIP-A, not UNIACT, it was necessary to equate UNIACT scores to ACT VIP-A scores in order to generate UNIACT norms. The equating sample (a subgroup of the Sample F holdout sample described earlier) consisted of 643 11th grade students (slightly more females than males) enrolled in four schools in Virginia, Oklahoma, Indiana, and Louisiana. Urban, suburban, and rural settings were represented. More than two-thirds of the 11th graders in these schools took both interest inventories in a counterbalanced design involving immediate retesting. Scores on the UNIACT Data/Ideas and Things/People Summary Scales were equated, separately by sex, to data/ideas and things/people factor scores derived from the six ACT VIP-A scales. Equipercentile equating was used. Following the equating, UNIACT national norms distributions were determined for the randomly selected 10% sample described above. As shown in the handbook for the lower level ACT CPP, (ACT, 1974), the characteristics of the 10% sample (N=930) were nearly identical to those of the entire sample (N=9,307).

TABLE 3.11

UNIACT Means and Standard Deviations for the UNIACT AAP Norms Sample and a 10% Sample of 1978-79 AAP Participants

		Science		Creative Arts		Social Service		Business Contact		Business Detail		Technical	
Sample	*N*	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*
UNIACT norms sample													
Males	1,247	51.0	9.7	48.2	9.7	48.0	10.2	49.8	9.9	49.6	9.4	51.7	9.5
Females	1,693	49.3	10.2	51.3	10.0	51.5	9.5	50.2	10.0	50.3	10.5	48.8	10.3
Total	2,940	50.0	10.0	50.0	10.0	50.0	10.0	50.0	10.0	50.0	10.0	50.0	10.0
1978-79 10% sample[a]													
Males	34,478	50.5	9.8	48.0	9.5	47.2	10.0	49.7	9.6	49.5	9.3	51.2	9.7
Females	42,497	48.1	10.4	50.8	9.8	50.7	9.5	49.9	10.0	50.1	10.3	47.5	10.0
Total	76,975	49.2	10.2	49.5	9.8	49.1	9.9	49.8	9.8	49.9	9.9	49.2	10.0

[a] Includes 10% of high school AAP participants tested on the national test dates (N = 76,975).

UNIACT combined-sex norms for the Data/Ideas and Things/People Summary Scales form the basis for the score chart or grid (shown in Appendix E) used to identify a person's World-of-Work Map region in VIESA. Raw scores for these scales are positioned on the vertical and horizontal margins, respectively, so that the average raw scores for the entire norm group are approximated by the axes cutting through the middle of the chart. In addition, the raw score intervals on both axes are spaced so that equal distances on each axis will approximate equal fractions of a standard deviation unit. Thus, a raw score located one inch above the horizontal axis represents approximately the same relative standing in the norm group as a raw score located one inch above (to the right of) the vertical axis. Since reports of relative standing on the UNIACT Data/Ideas and Things/People Summary Scales are not routinely provided in VIESA, the UNIACT norms tables for these scales are not normally required in VIESA interpretation. Those VIESA users who wish to translate UNIACT Data/Ideas and Things/People raw scores into stanine scores and percentile ranks may refer to the national raw score norms provided in Appendix E.

CHAPTER 4

SCALE RELIABILITY, STABILITY, AND SEX BALANCE

This chapter begins a summary of UNIACT psychometric characteristics for persons in general. Chapter 8 provides similar data for various racial/ethnic groups.

Internal Consistency Reliability Estimates

UNIACT means, standard deviations, and internal consistency estimates of reliability are shown in Table 4.1 for the 2,940 college-bound students in the UNIACT AAP norms sample and for the 1,851 high school juniors in the holdout subgroups of Samples E and F (described in Chapter 3). For the AAP norms sample, coefficient alpha estimates of reliability for the six basic interest scales range from .83 to .93 (median of .86) for males and from .81 to .92 (median of .86) for females. For the 11th grade students, these coefficients (for males and females combined) range from .85 to .92 (median of .87). The standard error of measurement (not shown in the table) ranges from about 3 to 4 *T*-score units (mean of 50, standard deviation of 10) across the two samples.

Coefficient alpha was not appropriate for estimating the reliabilities of the Data/Ideas and Things/People Summary Scales (D/I and T/P Scales). This estimate is, in effect, the mean of the split-half reliability coefficients resulting from all possible splits of a scale (Chronbach, 1951). Due to the bipolar nature of the D/I and T/P Scales, most of the possible splits would not provide meaningful reliability estimates. For example, one clearly inappropriate split for the D/I Scale would consist of all "data" items in one of the

TABLE 4.1

Internal Consistency Estimates of UNIACT Reliability

	College-bound students[a]						High school juniors[b]		
	Males			Females					
Scale	Mean	*SD*	Alpha[c]	Mean	*SD*	Alpha[c]	Mean	*SD*	Alpha[c]
Science	2.20	.58	.93	2.10	.60	.92	1.84	.59	.92
Creative Arts	2.09	.51	.88	2.26	.51	.88	2.00	.53	.89
Social Service	2.34	.42	.84	2.48	.37	.81	2.20	.41	.85
Business Contact	2.16	.43	.84	2.17	.43	.83	1.96	.43	.85
Business Detail	2.01	.49	.88	2.05	.54	.90	1.87	.50	.90
Technical	1.89	.42	.83	1.77	.44	.84	1.80	.44	.85
Data/Ideas	12.9	5.9	.88[d]	13.5	6.1	.88[d]	14.3	5.3	.75[d]
Things/People	12.7	4.4	.78[d]	10.5	4.1	.76[d]	13.1	4.2	.82[d]

[a]The UNIACT AAP norms sample.

[b]Holdout subgroup of Samples E and F (914 males and 937 females) described in Chapter 3.

[c]Cronbach (1951) Coefficient Alpha, except as indicated.

[d]Split-half reliabilities

"half scales," and all "ideas" items in the other. As an alternative to the coefficient alpha procedure, split-half estimates were computed by dividing each of the bipolar scales into two parallel forms. One of the half scales for D/I, for example, contained seven data items and eight ideas items. The reverse was true of the other half scale.

The split-half estimates of reliability of the D/I and T/P Scales are shown at the bottom of Table 4.1. For the college-bound sample, values on the D/I Scale are .88 for both males and females. Estimates for the T/P Scale are .78 for males and .76 for females. For the combined-sex 11th grade sample, the split-half estimates for the D/I and T/P Scales are .75 and .82, respectively. Standard errors of measurement are about 3 to 5 *T*-score units for both scales. The reliability estimates for the 30-item scales are, in some instances, lower than those observed for the 15-item basic interest scales, possibly because the contribution of response set variance to the reliability index is minimized with bipolar scales.

Stability Coefficients

Short-term Stability

UNIACT stability coefficients obtained over a 6-week interval are shown in Table 4.2. The study was based on a stratified sample (described by Lamb & Prediger, 1979) of

TABLE 4.2

Test-Retest Stability Coefficients

	Males					Females				
	Test		Retest			Test		Retest		
Interest scale	Mean	*SD*	Mean	*SD*	*r*	Mean	*SD*	Mean	*SD*	*r*
					6-week interval[a]					
Science	49.3	10.1	48.7	11.6	.84	48.4	10.3	47.3	11.5	.86
Creative Arts	48.4	10.4	47.5	11.4	.82	51.4	10.3	51.8	11.8	.82
Social Service	47.9	10.2	46.7	11.7	.76	50.3	10.2	50.9	11.1	.79
Business Contact	50.3	10.3	49.6	12.8	.79	50.5	10.6	50.1	12.2	.78
Business Detail	51.2	10.2	50.1	11.9	.81	51.8	10.4	50.9	12.2	.84
Technical	51.0	9.9	50.5	11.2	.79	48.4	10.2	47.9	11.4	.81
					2½-year interval[b]					
Science	50.4	10.2	50.6	9.5	.65	50.4	10.2	51.0	10.3	.67
Creative Arts	49.6	9.7	52.0	9.8	.69	50.0	9.8	51.2	10.0	.71
Social Service	49.6	9.9	51.8	9.5	.65	49.8	9.7	48.7	9.6	.61
Business Contact	49.5	10.1	51.0	10.4	.63	49.4	9.7	51.0	10.3	.59
Business Detail	50.4	10.3	51.7	10.6	.60	49.8	9.7	50.3	10.0	.61
Technical	49.5	9.9	51.3	10.0	.69	50.1	10.4	53.2	11.3	.55
					4-year interval[c]					
Science	55.6	9.1			.60	56.5	9.9			.61
Creative Arts	52.6	8.7			.58	53.2	9.2			.56
Social Service	50.8	8.3			.47	48.5	9.8			.57
Business Contact	50.7	10.1			.56	50.5	9.8			.54
Business Detail	52.2	9.2			.49	51.2	9.4			.59
Technical	51.8	9.0			.55	53.8	10.4			.59

[a]Based on ACT-IV scores of 737 male and 852 female AAP registrants, in selected academic major choices (Lamb and Prediger, 1979).

[b]Based on ACT-IV scores of a random sample of 670 male and 1,124 female AAP registrants followed up as college sophomores.

[c]Based on 734 male and 778 female AAP participants retested as seniors at 15 universities (Lamb & Prediger, 1979). At the initial testing, participants responded to ACT-IV items with the same five-point Likert scale used in the 6-week and 2½-year studies. (Options ranged from "dislike very much" to "like very much.") However, a three-response Likert scale was used at retesting. Since comparable norms are not available for the different score scales, correlations are based on raw scores, and standard score data are shown only for the initial testing.

737 male and 852 female high school seniors tested as AAP participants on the October 1977 national test date. Students who planned academic majors representing each of the six Holland interest areas were selected to provide approximately equal numbers of individuals of each sex in each area. (This selection procedure was a requirement of a validation study using the same data.) Test-retest correlations for the six scales assessing Holland types range from .76 to .84 (median of .80) for males and from .78 to .86 (median of .82) for females. These UNIACT correlations are slightly lower than those obtained for the ACT-IV in a 2-month test-retest study reported by Hanson (1974, p. 151). For a sample of 300 college-bound students, values in the Hanson study ranged from .80 to .89 (median of .86).

Perspective on the magnitude of the test-retest correlations cited above is provided by comparison with data for other interest inventories assessing Holland types. Test-retest coefficients over a 1-month period for the General Occupational Theme Scales on the Strong-Campbell Interest Inventory (SCII), as reported by Campbell (1977, pp. 34-35), ranged from .84 to .91 (median of .86) for a sample of 102 persons, mostly adults. Although these correlations are slightly higher than those obtained for the ACT Interest Inventory, substantial SCII test-retest correlations might be expected because of the greater maturity level of sample members and the longer length of the SCII Theme Scales (20 items per scale, compared with 15 for UNIACT and the ACT-IV). SCII General Theme Scale 3-month test-retest correlations for a high school sample (median age = 17.1, *N* = 208) were provided by Blake and Fabry (1979). The values are comparable to the 6-week correlations for UNIACT, ranging from .71 to .89 (median of .80).

For the Vocational Preference Inventory, Holland (1975, p. 8) reported 2-week test-retest correlations ranging from .65 to .83 (median of .72) for 31 adult women and 2-month test-retest correlations ranging from .57 to .84 (median of .70) for 28 adult women. Results of a Self-Directed Search test-retest study involving a sample of 10th through 12th graders have also been reported by Holland (1979, pp. 46-47). Test-retest correlations for a 3-4 week interval ranged from .31 to .87 (median of .61) for 118 males, and from .44 to .78 (median of .64) for 57 females. Again, the UNIACT and ACT-IV test-retest correlations compare quite favorably, particularly since the SDS data are based on 38-item Summary Scales.

Stability data for the data/ideas and things/people dimension (factor) scores and for the World-of-Work Map region number were also obtained in the 6-week study cited above. (The data/ideas and things/people dimension scores are reported to AAP participants as coordinates on the Map of College Majors, shown in Figure 1.5.) For both males and females, test-retest correlations for the data/ideas score were .88. Correlations for the things/people scale were .84 for both males and females. These values correspond to standard errors of measurement of 3 to 4 standard score units.

UNIACT interpretation instructions suggest that individuals consider for exploration occupations in their own region and in the adjacent regions. Consequently, stability of the World-of-Work Map region in the 6-week study was assessed by determining the percentage of individuals whose region, as computed from their retest scores, was the same as or adjacent to the region computed from their initial test scores. For both males and females, this value was 85%. Thus, the retest scores provided substantial replication of the regions obtained on initial testing. (Excluded from the analysis were approximately 14% of the sample members who had either initial or retest scores resulting in assignment to "Region 99." As explained in Appendix E, Region 99 is assigned to individuals with a profile which is either too "flat" or too "conflicting" to be meaningfully associated with a World-of-Work Map region.)

Long-term Stability

The vocational interests assessed by basic interest scales are psychological traits which, by definition, should be relatively stable from week to week. Over longer periods of time, however, vocational interests may change for many individuals. To the extent that this occurs, test-retest correlations will be reduced. Change is especially likely during critical periods in the career development process, such as the transition between high school and college.

Results of two long-term stability studies with the ACT Interest Inventory are reported in Table 4.2. In both cases the time period covered was the transition from high school to college. In the 2½-year study, the sample consisted of college-bound students in the original ACT-IV norms group (described by Hanson, 1974). Of the initial sample of 3,439 students, 1,794 were retested by mail (response rate of 52%) when most were college sophomores. As expected, correlations between scores obtained over the 2½-year interval are appreciably lower than those obtained over the 2-month interval. The values for the 2½-year interval range from .60 to .69 for males (median of .65) and from .55 to .71 for females (median of .61).

Examination of the test and retest mean scores suggests the manner in which the interests of this group changed over the transition period. The largest changes were increases in the mean Technical score for females (3.1 points) and the Creative Arts (2.4 points) and Social Service (2.2 points) scores for males. In contrast, test and retest means shown in Table 4.2 for the 6-week study are nearly identical. The extent to which the changes in mean scores across 2½ years are due to the influence of the college experience, general maturation, changes in society, etc., cannot be determined from the data.

The target sample in the 4-year test-retest study consisted of 2,096 college seniors at 15 universities who had (a) taken the ACT Interest Inventory as high school seniors and (b) progressed from college freshman to senior status in their college of initial enrollment in the traditional 3-year interval. Of the 2,096 target sample members, 734 males and 778 females returned retest questionnaires, a response rate of 72%. As expected, test-retest correlations are lower than those for the 2½-year study. Values range from .47 to .60 for males (median of .56) and from .50 to .61 for females (median of .56).

ACT Interest Inventory stability correlations comparable to those obtained in the 4-year test-retest study have been reported by Michal (1979) for a 3-year study. The sample consisted of 180 male and 250 female AAP registrants who enrolled at a midwestern university and who were retested

via the mail as juniors. (The response was 42%.) Correlations ranged from .50 to .58 (median of .56) for males, and from .53 to .60 (median of .56) for females.

Higher long-term stability coefficients have been reported by Campbell (1977, pp. 34-35) for the SCII General Occupational Theme Scales. Over a 3-year interval, correlations based on test-retest data for 75 males and 65 females ranged from .78 to .87, with a median of .81. (No information is provided regarding initial sample size or response rate.) However, study participants were all employed adults. As shown by Johansson and Campbell (1971), the magnitude of interest inventory stability correlations is a function of the mean age of sample members at the time of initial testing. Thus, higher stability coefficients would be expected in the SCII study. Participants in the ACT Interest Inventory studies were high school students engaged in the school-to-college transition when initially tested.

Results of long-term stability studies with adolescents or young adults provide a more meaningful context for viewing the long-term stability coefficients for the ACT Interest Inventory. In one such study (Holland, 1975, pp. 7-8), VPI stability coefficients are reported for 432 males and 204 females tested when they were National Merit finalists, and retested 4 years later. (No data are provided on initial sample size or response rate.) Correlations on the six basic interest scales range from .47 to .61 (median of .57) for males and from .45 to .67 (median of .50) for females. These values are comparable to those obtained in the 4-year ACT Interest Inventory study. Hansen and Stocco (1980) reported long-term SVIB stability data for both high school and college samples. The high school sample consisted of 31 males and 39 females tested as 9th graders, then retested 4 years later as high school seniors. For the combined-sex sample, General Occupational Theme Scale test-retest correlations ranged from .30 to .69 (median of .52), somewhat lower than those obtained in the ACT Interest Inventory 4-year study (as would be expected for younger students). The college sample consisted of 2,000 students, initially tested as enrollees in a university liberal arts college, of whom 615 (31%) completed retest questionnaires mailed to them 3½ years later. Correlations ranged from .54 to .74 (median of .66), somewhat higher values than those obtained in the ACT Interest Inventory studies.

Degree of Sex Balance

Male-Female Score Overlap

Summary statistics on the percentages of males and females responding "like" to individual UNIACT items were presented in Chapter 3. Another way to evaluate sex differences is to examine UNIACT raw score means for each sex. If sex balance has been approximated at the item level, raw score means should be similar for males and females and the overlap of the male and female distributions for each scale should be high. As noted in Chapter 2, Dunnette (1966) has suggested that two distributions which overlap less than 75% are different in meaningful ways. Strong (1955) proposed that "two groups that overlap less than 80 percent are different enough to be considered practically different" (p. 22). Thus, according to these definitions, distributions which overlap more than 75% to 80%, as determined by Tilton's (1937) method, should not be considered dissimilar.

Table 4.3 presents UNIACT scale means, standard devia-

TABLE 4.3

Male-Female Score Overlap for UNIACT Scales

Scale (Holland types in parentheses)	College-bound sample[a]					Percent overlap: 11th grade samples		Percent overlap: Other instruments	
	Males		Females						
	$\bar{X}$	*SD*	$\bar{X}$	*SD*	Percent overlap	1[b]	2[c]	ACT-IV[d]	SDS[e]
Science (I)	2.20	.58	2.10	.60	93	90	85	91	77
Creative Arts (A)	2.09	.51	2.26	.52	87	94	97	78	78
Social Service (S)	2.34	.42	2.48	.37	85	84	85	61	50
Business Contact (E)	2.16	.43	2.17	.44	99	96	87	90	87
Business Detail (C)	2.01	.49	2.05	.54	97	97	88	93	75
Technical (R)	1.89	.42	1.77	.44	89	82	86	59	32
Data/Ideas Summary Scale	12.90	5.86	13.50	6.10	96	95	100	f	f
Things/People Summary Scale	12.70	4.43	10.48	4.15	80	76	76	f	f

Note. Percent overlap is based on Dunnette's (1966) table for Tilton's (1937) measure of overlap.

[a] The UNIACT AAP norms sample (1,247 males and 1,693 females).

[b] The 914 male and 937 female 11th graders in the holdout subgroups of Samples E and F (described in Chapter 3).

[c] A sample of 246 male and 242 female 11th graders (Lunneborg, 1980).

[d] Based on raw score data for the 567 male and 484 female 11th graders in the holdout subgroup of Sample E. These data are shown for comparative purposes only, as sex balance in the ACT-IV is achieved with same-sex norms.

[e] Based on Self-Directed Search (SDS) raw (summary) scores for 2,152 male and 2,431 female high school students (Gottfredson & Holland, 1975a).

[f] These scales are not included in the ACT-IV or SDS.

tions, and percentages of overlap for males and females in a college-bound sample (the UNIACT AAP norms sample) and for two 11th grade samples. For the college-bound sample, male-female overlap for the six basic interest scales ranges from 85% to 99%. The overlap for the Social Service and Technical Scales, which correspond to interest areas traditionally exhibiting large sex differences, are 85% and 89%, respectively. Overlap for the Data/Ideas Scale is 96%, indicating excellent sex balance. Overlap on the Things/People Scale (80%) is somewhat lower.

The percentages of overlap shown in Table 4.3 for two 11th grade samples are slightly lower, with the lowest values on the Things/People Scales (76% for both samples). Thus, with the borderline exception of the Things/People Scale for the 11th grade sample, the overlap values meet the criteria proposed by Strong (1955) and Dunnette (1966). Percentage of overlap data are also provided in Table 4.3 for ACT-IV and SDS raw scores. (ACT-IV data are provided for illustration purposes only. Raw score reports were discontinued after the first year of use.) Overlap ranges from 59% to 93% for the ACT-IV and 32% to 87% for the SDS. (Table 2.2 provides similar results for other interest inventories assessing Holland's types.)

In summary, the data indicate that perfect scale sex balance has not been achieved with UNIACT. However, a substantial improvement has been realized over the sex balance typical of "traditional" inventories (i.e., inventories not constructed to achieve sex balance at the item level).

Career Options Suggested to Males and Females

The extent to which UNIACT provides similar career suggestions to males and females is illustrated by the distributions of World-of-Work Map regions reported to each sex. As noted in Chapter 1, individuals are encouraged to explore occupations in their region and in adjacent regions.

A person's World-of-Work Map region is determined from his or her data/ideas and things/people scores. These two scores can be obtained either from the Data/Ideas and Things/People Summary Scales, or from data/ideas and things/people dimension (factor) scores based on linear composites of the six interest scales. As reported in Chapter 5, same-named Summary Scale and dimension scores are highly correlated.

Table 4.4 indicates the percentage of males and females scoring in each World-of-Work Map region as computed both from the Data/Ideas and Things/People Summary Scales and the corresponding dimension scores. Although there is a tendency for males to be referred more often to "things" occupations (regions 5-8) and females more often to "people" occupations (regions 11, 12, 1, and 2), the overlap data in Table 4.3 indicate that these male-female differences would be much larger if sex-restrictive scores (as defined in Chapter 2) were used to compute a person's World-of-Work Map region.

TABLE 4.4

Percentages of Males and Females Scoring in Each World-of-Work Map Region as Determined from Dimension Scores and Scale Scores

World-of-Work Map region	Dimension scores		Scale scores	
	Males	Females	Males	Females
1	3.4	8.9	4.7	8.2
2	4.8	8.7	5.7	10.8
3	6.7	8.0	6.5	9.8
4	6.7	6.1	5.1	6.9
5	10.5	6.1	9.3	5.0
6	10.7	5.6	10.9	5.8
7	12.1	5.5	9.6	4.5
8	9.7	6.7	11.2	5.8
9	8.6	7.1	8.2	6.6
10	5.6	8.7	6.9	7.8
11	5.6	9.1	4.6	8.7
12	4.4	8.4	4.3	7.1
99[a]	11.1	11.1	13.2	13.1

Note. Based on the UNIACT AAP norms sample (1,247 males and 1,693 females).

[a]Region "99" (for the AAP) or Region "?" (for the VIESA) is reported to persons with a flat profile, i.e., data/ideas and things/people scores placing them near the center of the map. Region 99 is also reported to AAP participants with conflicting profiles, i.e., high (or low) scores on both "data" and "ideas," or on both "things" and "people."

CHAPTER 5

CONVERGENT AND DIVERGENT VALIDITY

This chapter summarizes evidence bearing on the convergent and divergent validity of UNIACT scales. Scale intercorrelations, factor structure, and correlations with other measures are discussed. New information, as well as material published in ACT Research Report 78 (Hanson, Prediger, & Schussel, 1977) and the handbook for the lower-level ACT CPP (ACT, 1974), is included.

The validity data presented in this chapter and those presented in Chapters 2, 3, and 6 through 8 of this report document the construct validity of the ACT Interest Inventory as a measure of basic vocational interests. Lists of the various validity studies are provided in Appendix A (ACT-sponsored research) and Appendix B (other studies).

UNIACT Scale Intercorrelations

The intercorrelations of the six UNIACT basic interest scales for college-bound males and females are presented in Table 5.1. Intercorrelations for combined groups of males and females are shown in Table 5.2 for these same college-bound individuals and for a cross-sectional sample of 11th graders. It would be expected that interest scales adjacent to each other in Holland's (1973) hexagonal structure of interests (depicted in Figure 1.1 of Chapter 1) would be more highly correlated than nonadjacent scales; scales located diagonally across the interest structure should have the lowest correlations. With few exceptions, the convergencies and divergencies among the six UNIACT scales are in accordance with theoretical expectations. For the combined-sex college-bound sample, for example, the correlations between the Business Contact Scale and each of its adjacent scales (Social Service and Business Detail) are both .53; the correlation with the Science Scale, located diagonally across the hexagon, is .07. The remaining scales, Creative Arts and Technical, have intermediate levels of correlation with the Business Contact Scale (.25 and .26, respectively), as would be expected from their location on the hexagon. (See also the UNIACT and ACT-IV intercorrelations in Table 3.4, Chapter 3.)

Tables 5.1 and 5.2 also provide correlational data for the Data/Ideas and Things/People Summary Scales (D/I and T/P Scales) and the corresponding theory-based dimensions, which are discussed below. As shown in Figure 1.1, the model underlying UNIACT requires that the D/I Scale should have high positive correlations with the Business Detail and Business Contact Scales and high negative correlations with the Science and Creative Arts Scales. The T/P Scale should have a high positive correlation with the Technical Scale and a high negative correlation with the Social Service Scale. Tables 5.1 and 5.2 indicate that the correlations exhibit this pattern for both the 11th grade and college-bound samples. In addition, the D/I and T/P Scales have very low intercorrelations, as expected. Finally, the two bipolar scales have substantial correlations with the corresponding theory-based dimensions computed as linear composites of the six basic interest scale scores. For the combined-sex college-bound sample, the correlations of the D/I and T/P Scales with the corresponding dimensions are .87 and .86, respectively.

UNIACT Scale Structure

Theory-based Dimensions Underlying UNIACT

As noted in Chapter 1, the D/I and T/P dimensions appear to be compatible with the models central to the vocational theories of Holland (1973), Roe (1956), and Roe and Klos (1969). Prediger (1981, in press) shows how coordinate points for each scale in Holland's hexagon can be used to define the relative level of relationship between the scales and the D/I and T/P dimensions. In effect, values for the coordinate points define two theory-based dimensions (factors) that can be subjected to empirical verification, as described below.

Cooley and Lohnes (1971, pp. 137-143) provide a computer program for extracting predefined orthogonal factors from a correlation matrix. (As used here, "factors" refer to principal components.) No factor rotations are involved. Instead, the program "causes the computer to respect the presumption for each factor *as far as it can*" (p. 137, italics added). The Cooley-Lohnes procedure (1971) can be used to extract the two theory-based interest dimensions (as defined by the coordinates for Holland's hexagon). If the two theory-based dimensions fit the data perfectly, they should account for the maximum amount of variance that can be accounted for by any two *interest* (as opposed to response set) dimensions. To be useful, they should also account for a substantial portion of total variance. A principal components analysis provides the comparative data. (As explained in the following section, response set variance must be treated separately in the analyses.)

It is important to note that in principal components analysis (and factor analysis, in general), an infinite number of rotations are possible for an initial factor loading matrix. All will account for the same total percentage of variance. Thus, there are no "real" scale loadings on the factors with which to compare scale loadings on the theory-based dimensions. However, if the two theory-based dimensions are useful summaries of UNIACT intercorrelations, one would expect them to account for about as much variance as dimensions derived via principal components analysis; and,

TABLE 5.1

UNIACT Scale Intercorrelations for College-bound Males and Females

Interest scale	Science	Creative Arts	Social Service	Business Contact	Business Detail	Technical	Bipolar scales		Theory-based dimensions	
							Data/Ideas	Things/People	Data/Ideas	Things/People
Science	—	30	27	09	11	24	-63	06	-51	18
Creative Arts	32	—	44	23	02	27	-40	-22	-48	-40
Social Service	29	39	—	58	24	26	-06	-64	05	-64
Business Contact	07	27	51	—	57	27	37	-42	57	-39
Business Detail	06	-01	16	50	—	31	51	01	65	18
Technical	36	39	23	26	31	—	-03	40	03	42
Data/Ideas scale	-63	-38	-08	36	57	-09	—	-06	87	00
Things/People scale	09	-13	-60	-35	13	47	-02	—	-12	86
Data/Ideas factor	-54	-48	-01	53	67	-08	88	-08	—	00
Things/People factor	25	-28	-57	-33	30	50	-01	85	00	—

Note. Correlations (decimal points omitted) are based on the 1,247 males and 1,693 females in the UNIACT AAP norms sample (described in Chapter 3). Correlations for males are shown above the diagonal.

TABLE 5.2

UNIACT Scale Intercorrelations for College-bound and Eleventh Grade Students

Interest scale	Science	Creative Arts	Social Service	Business Contact	Business Detail	Technical	Bipolar scales		Theory-based dimensions	
							Data/Ideas	Things/People	Data/Ideas	Things/People
Science	—	30	26	07	07	32	-63	09	-52	23
Creative Arts	31	—	43	25	01	31	-37	-20	-47	-35
Social Service	32	42	—	53	20	21	-06	-63	02	62
Business Contact	16	31	55	—	53	26	37	-37	55	-35
Business Detail	14	06	28	57	—	30	55	07	66	23
Technical	27	27	21	30	33	—	-07	45	-03	48
Data/Ideas scale	-60	-34	-05	34	53	00	—	-05	87	-02
Things/People scale	02	-19	-59	-29	06	49	03	—	-09	86
Data/Ideas factor	-48	-45	04	52	65	04	84	-03	—	00
Things/People factor	19	-36	-60	-35	17	49	-02	83	00	—

Note. Decimal points have been omitted. Values above the diagonal are for college-bound students (the 1,247 males and 1,693 females in the UNIACT AAP norms sample). Values below the diagonal are for 11th grade students (the 814 males and 937 females in the holdout subgroups of Samples E and F, described in Chapter 3).

as noted above, they should also account for a substantial portion of total variance.

Factor loadings derived from intercorrelations for the combined-sex college-bound and 11th grade samples (Table 5.2) are presented in Table 5.3. Scale loadings (correlations) for the theory-based dimensions, as determined by the Cooley-Lohnes procedure (1971), are given at the left side of Table 5.4. The dimensions account for the same proportions of variance as the factors (principal components). Table 5.4 also shows theory-based dimension loadings for two other editions of the ACT Interest Inventory. The dimensions underlying the three editions are nearly identical.

UNIACT theory-based dimension loadings for the combined-sex college-bound sample are plotted in Figure 5.1. The correspondence between the scale locations shown in Figure 5.1 and Holland's (1973) hexagonal model shown in Figure 1.1 is readily evident. The hexagonal configuration proposed by Holland is reproduced with nearly equal distance between scales and the scales are arranged in the expected order. Loadings for males (Figure 5.2) and females (Figure 5.3) are highly similar, thus indicating the same basic interest structure for males and females. (ACT Research Report 78 contains plots for the 11th grade sample.)

TABLE 5.3

UNIACT Principal Components Loadings for College-bound and Eleventh Grade Samples

	College-bound sample[a]		Eleventh grade sample[b]	
Interest scale	D/I	T/P	D/I	T/P
Science	-56	35	-51	33
Creative Arts	-50	-28	-55	-18
Social Service	-06	-49	-14	-44
Business Contact	47	-24	36	-27
Business Detail	64	33	63	14
Technical	-13	57	03	66
Variance accounted for[c]	34%	26%	32%	26%

Note. Decimal points have been omitted.

[a]The UNIACT AAP norms sample (1,247 males and 1,693 females).

[b]Holdout subgroups of Samples E and F (914 males and 937 females), described in Chapter 3.

[c]Percentage of variance accounted for by data/ideas (D/I) and things/people (T/P) factors after variance associated with the response set factor is removed.

Response Set Factor

Not shown in Tables 5.3 and 5.4 is a general factor common to interest inventories using response categories such as "like," "indifferent," and "dislike." When these categories are used, the frequency with which a particular response is chosen tends to vary from person to person, regardless of item content. That is, some persons tend to choose "like" more often than others, some choose "indifferent" more often, etc. If the categories are scored in the same way (e.g., 3, 2, 1) for each item, scores on the interest scales will be affected by the person's response set—sometimes called "overall checking rate" (Holland, Whitney, Cole, & Richards, 1969, p. 16), or "acquiescent style" (Holland, 1975, p. 8).

Prediger (1981) provides data regarding the extent to which response set affects the scores of various interest measures. Those data, based on 24 intercorrelation matrices for instruments assessing Holland's types, show that the response set factor often accounts for 40% or more of the total interpersonal variance. In factor analyses, the chief identifying feature of a response set factor is that, in the initial factor matrix, all interest scales have relatively high loadings on it. Often these loadings are in the 60s and 70s. The presence of a response set factor is not usually evident in reports of factor analyses because response set variance is allocated to other factors via a procedure such as varimax. As a result, the identification of basic interest dimensions is clouded.

A response set factor is not present in forced-choice interest inventories, such as the Kuder General Interest Survey and the Vocational Interest Inventory (VII). For example, the VII principal components analysis reported by Lunneborg & Lunneborg (1975) reveals no response set factor—in contrast to Vocational Preference Inventory (VPI) results for the same sample. (The VPI assigns one point to all "yes" responses.) A response set factor is also avoided in interest inventories that score the same response category (e.g., "like") both positive and negative, depending on the item. Thus, the results of several factor analyses of the Strong occupational scales provide no evidence of a response set factor (Strong, 1943, pp. 139-154). The factors that were obtained were all bipolar, both before and after rotation.

In the analyses reported above, a response set factor was obtained by conducting a principal components analysis on the residual matrix resulting from extraction of the theory-based dimensions. The first factor to emerge accounted for about 40% of the total variance for each of the three interest inventories. (The range was 39% to 42%.) UNIACT scale loadings for this factor ranged from .55 to .69 for the college-bound sample, with a median of about .62. These results for UNIACT are comparable to those found for other inventories. In the principal components analyses reported in Table 5.3, the response set factor was the first to emerge. It also accounted for about 40% of total variance. In tables 5.3 and 5.4 "variance accounted for" was determined after variance associated with the response set factor was removed.

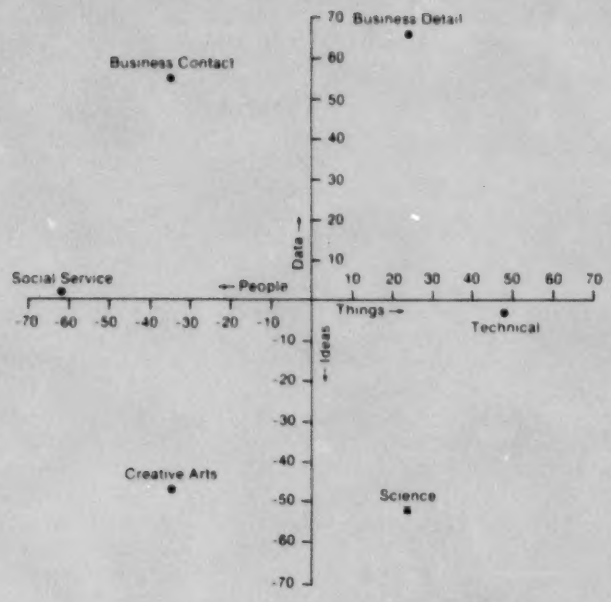


Figure 5.1. Plot of UNIACT theory-based factor loadings for a combined-sex college-bound sample. (Data are based on the 1,247 males and 1,693 females in the UNIACT AAP norms sample.)

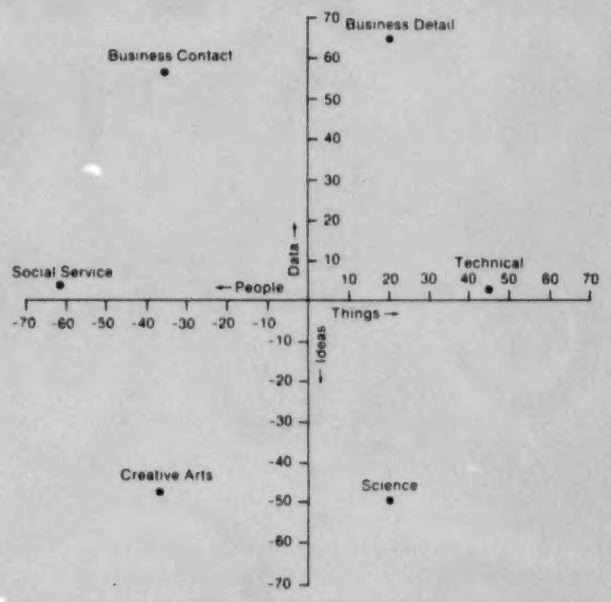


Figure 5.2. Plot of UNIACT theory-based factor loadings for college-bound males. (Data are based on the 1,247 males in the UNIACT AAP norms sample.)

TABLE 5.4

UNIACT, ACT-IV, and ACT VIP-A Scale Loadings on the Theory-based Dimensions for the College-bound and Eleventh Grade Samples

	UNIACT							
	College-bound sample		Eleventh grade sample		ACT-IV		ACT VIP-A	
Interest scale	D/I	T/P	D/I	T/P	D/I	T/P	D/I	T/P
Science	-52	23	-48	19	-49	17	-45	21
Creative Arts	-47	-35	-45	-36	-47	-35	-43	-40
Social Service	02	-62	04	-60	05	-61	05	-58
Business Contact	55	-35	52	-35	51	-39	52	-33
Business Detail	66	23	65	17	63	21	66	14
Technical	-03	48	04	49	01	49	08	49
Variance accounted for[a]	34%	26%	32%	26%	31%	27%	31%	26%

Note. Decimal points have been omitted for scale loadings. Data are based on the following samples: UNIACT, college-bound sample—the UNIACT AAP norms sample (1,247 males and 1,693 females); UNIACT, eleventh grade sample—holdout subgroups of Samples E and F (914 males and 937 females); ACT-IV—holdout subgroup of Sample E (N = 1,031); ACT VIP-A—holdout subgroup of Sample F (N = 820). Samples E and F are described in Chapter 3.

[a]Percentage of variance accounted for by the D/I and T/P dimensions after variance associated with the response set factor is removed.

Evidence from Other Measures of Holland's Types

In order to determine the generalizability of the D/I and T/P dimensions, Prediger (1981) applied the Cooley-Lohnes factor extraction procedure to intercorrelations reported in published studies of the following interest inventories: Vocational Preference Inventory (9 samples), Self-Directed Search (4), Strong-Campbell Interest Inventory (3), Strong Vocational Interest Blank (2), and Career Assessment Inventory (2). In the summary presented below, results for these 20 samples are combined with results for the four UNIACT separate-sex samples already described. The 24 samples (11 all-male, 11 all-female, and 2 combined-sex) in the interest structure analyses include high school students, college students, and adults (total N = 11,275). Across the studies, the data/ideas and things/people dimensions accounted for 48% to 65% of the variance (average of 60%) not accounted for by response set. These results were nearly identical to the results obtained from principal components analyses.

In general, analyses of data for a variety of interest inventories and samples indicate that the two theory-based dimensions fit the data quite well. Furthermore, the configuration of relationships between interest types and the two dimensions generally approximates the hexagon shown in Figure 1.1. In every instance, the E and C Scales (abbreviations for scale types are defined in Chapter 1) had the highest positive correlations with the D/I dimension, and the A and I Scales had the highest negative correlations. The S Scale, followed by the A and E Scales, had the highest negative correlation with the T/P dimension and, except for one instance, the R Scale, followed by the C and I Scales, had the highest positive correlation. (In the exception, the correlation for the I Scale was slightly higher than that for the R Scale.) One way to summarize results across the 24 studies is 143 "hits" and one miss; that is, (24 times 6) - 1 = 143.

Typical results are shown by Figure 5.4, which depicts the theory-based dimension loadings computed from correlations reported by Holland (1973, p. 23) for the VPI—the initial instrument developed by Holland to assess his six types. The configuration of VPI scales is nearly identical to the configuration for UNIACT shown in Figures 5.1-5.3. As Holland (1979) notes, "At best, the hexagons resulting from real-world data are misshapen polygons . . . . The hexagon is an ideal" (p. 43). When one considers the infinite variety of relationships possible for six scores, however, the approximation to Holland's model is striking.

Taken together, results of the theory-based analyses of UNIACT and other interest inventories provide impressive evidence of the explanatory power of the D/I and T/P dimensions. These two theory-based dimensions appear to provide a sensible and useful foundation for the structure of human interests.

Correlations with Other Measures

To the extent that the ACT Interest Inventory scales possess convergent and divergent validity, one would expect relatively high correlations with other measures of similar

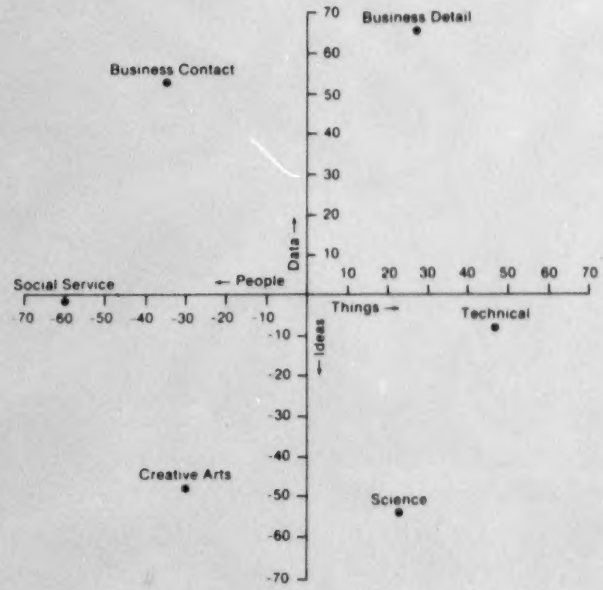


Figure 5.3. Plot of UNIACT theory-based factor loadings for college-bound females. (Data are based on the 1,693 female members of the UNIACT AAP norms sample.)

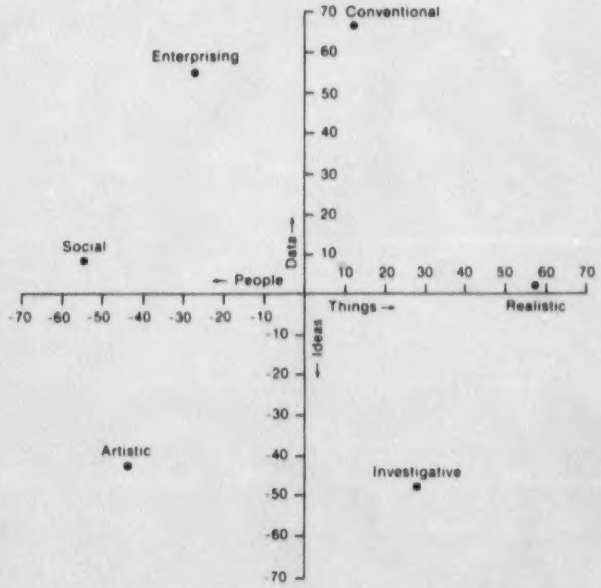


Figure 5.4. Plot of data/ideas and things/people factor loadings for the VPI.

constructs and low correlations with measures of dissimilar constructs. Analyses related to this expectation are summarized below.

Other Measures of Holland's Types

Correlations between the ACT Interest Inventory scores of 338 11th graders and VPI scores obtained 6 weeks later are presented in Table 5.5. For males, the correlations between corresponding scales range from .35 (Business Detail with Conventional) to .62 (Creative Arts with Artistic) with a median of .46. The pattern is similar for females, with values ranging from .36 to .61 (median of .52). Considerable discriminant validity is evident, in that correlations between parallel scales are substantially higher than correlations between dissimilar scales.

Perspective on the magnitude of these results is provided by correlations between the VPI and the SDS (Holland, 1979) reported in Chapter 3. The median correlations were .43 and .55 for college females and males, respectively. Considering that SDS scores are partly based on VPI scores and that the VPI-SDS correlations are concurrent, whereas there was a 6-week interval in the study described above, the ACT Interest Inventory and VPI correlations compare favorably with those for the SDS and VPI.

Correlations between corresponding scales on the ACT Interest Inventory and the Holland Theme Scales on the SVIB (or the nearly identical SCII Occupational Theme Scales) are shown in Table 5.6. For college seniors, these correlations range from .74 to .83 (median of .82) for males, and from .62 to .87 (median of .79) for females. Values for first-year college females range from .62 to .83 (median of .72) and values for high school seniors range from .63 to .76 (median of .68). In contrast, correlations between the 30 pairs of noncorresponding scales (not shown in Table 5.6) are, in general, quite low. For the college senior sample, the absolute value of these correlations ranges from .03 to .74 (median of .26) for males and from .00 to .53 (median of .22) for females. The ranges for the college freshman and high school senior samples are, respectively, .01 to .65 (median of .13) and .00 to .46 (median of .10). Thus, the data provide substantial evidence of convergent and divergent validity.

Perspective on the magnitude of the correlations between parallel scales cited above is provided by correlations between Vocational Preference Inventory (VPI) and SVIB Theme Scales. Blakeney, Matteson, and Holland (1972) reported correlations for corresponding scales ranging from .57 to .70 (median of .62) for 93 university business students.

Additional information pertinent to the relationship between the ACT Interest Inventory and other measures of Holland's types is provided by Lunneborg (1980) in the form of correlations between corresponding scales on UNIACT and the Vocational Interest Inventory (VII) (Lunneborg, 1976).

TABLE 5.5

Correlations between ACT Interest Inventory and VPI Scales
(6-week Interval)

	Vocational Preference Inventory scales						National stanines	
ACT Interest Inventory scales	Social	Enterprising	Conventional	Realistic	Investigative	Artistic	Mean	*SD*
Social Service	43 (53)	22 (07)	16(-10)	09(-02)	21 (16)	26 (14)	5.1(4.8)	2.0(2.0)
Business Contact	27 (20)	38 (36)	28 (12)	06 (02)	12 (00)	16 (04)	5.2(5.0)	1.8(1.8)
Business Detail	24 (07)	30 (18)	35 (51)	14(-09)	18(-08)	12(-16)	5.0(5.2)	1.8(1.9)
Technical	-14 (14)	00 (11)	00 (03)	48 (36)	04 (23)	-05 (17)	5.1(5.2)	1.8(1.9)
Scientific	17 (19)	14 (04)	17 (03)	12 (18)	58 (56)	18 (14)	5.0(4.8)	2.0(1.9)
Creative Arts	22 (23)	21 (27)	07(-13)	12 (28)	23 (24)	62 (61)	5.0(4.9)	1.9(1.8)
Mean[a]	1.5(3.5)	2.2(1.3)	1.4(1.9)	3.7(.8)	2.4(1.3)	1.8(2.2)		
SD	2.1(3.1)	2.5(1.8)	2.2(2.1)	3.1(1.4)	3.1(2.2)	2.6(2.9)		

Note. Correlations (decimal points omitted) are based on scores of 193 male and 145 female 11th graders from two high schools (ACT 1974, p. 82). Values for females are shown in parentheses. Results for parallel scales are underlined.

[a]VPI scores range from 0 to 14.

Values ranged from .34 to .57 (median of .44) for 488 high school juniors. Absolute values of the correlations between the other 30 scale pairs ranged from .00 to .37 (median of .14). Thus, substantial convergent and divergent validity was demonstrated. Although the VII was based on Roe's interest typology rather than Holland's, similarities in the two typologies have been repeatedly noted (e.g., see Holland, 1973, p. 81; Lunneborg & Lunneborg, 1975).

Taken as a whole, the correlations between corresponding scales of the ACT Interest Inventory (in its various editions) and other instruments assessing interests consistent with the Holland typology are similar to those of corresponding scales on the other instruments. The highest correlations are between corresponding scales on the ACT Interest Inventory and the Theme Scales on the SVIB (or SCII), with values generally higher than those cited between the VPI and SDS or between the VPI and SVIB Theme Scales. Thus, these correlational data provide additional evidence that the ACT Interest Inventory, in its various editions, assesses interests consistent with Holland's typology.

TABLE 5.6

Correlations between ACT Interest Inventory Scales and Parallel SVIB/SCII Holland Theme Scales

Interest scale	College seniors[a] M	College seniors[a] F	Female college freshmen[b]	High school seniors[c]
Science (Investigative)	93	87	80	71
Creative Arts (Artistic)	90	85	83	76
Social Service (Social)	74	77	68	65
Business Contact (Enterprising)	74	78	71	63
Business Detail (Conventional)	78	80	72	72
Technical (Realistic)	85	62	62	63
Median Correlation	82	79	72	68
N	62	83	126	91

Note. Decimal points have been omitted.

[a]Correlations with SVIB scales (Hanson, 1974).

[b]Correlations with SVIB scales (Hanson, Lamb, and English, 1974).

[c]Correlations with SCII scales (Fabry, Blake, and Seran, 1978).

Other Measures of Interests

Additional data relevant to the construct validity of the ACT Interest Inventory are provided in Table 5.7, where correlations with the Kuder General Interest Survey, Form E, (Kuder, 1964) are shown. About 8 weeks elapsed between administrations of the two inventories to 243 ninth graders. Since both inventories were designed to measure basic types of interests, relatively high correlations between scales purporting to measure similar types of interests should be obtained. Likewise, relatively low correlations should be obtained for dissimilar scales. The expectations are supported by the results presented in Table 5.7. In all cases, the correlations between similar scales are substantially higher than the correlations between dissimilar scales. The negative correlations probably result from the partial ipsativity of the Kuder scales.

Correlational data are also available between the ACT Interest Inventory and the Ohio Vocational Interest Survey (OVIS), developed by D'Costa, Winefordner, Odgers, and Koons (1970). The 24 rationally derived OVIS scales are based on a model for grouping occupations according to their level of involvement with data, people, and things, as reported in the DOT. One scale was developed for each of 24 groups of occupations, with scale content determined by the job duties typical of each occupational group. Thus, the 24 scales are occupation-oriented rather than person-oriented. They were not constructed to measure basic types of human interests, as were the ACT Interest Inventory scales, but were directly tied to the duties characterizing different types of occupations.

The OVIS was administered to 271 ninth grade students approximately 8 weeks before they completed the ACT Interest Inventory. Correlations between the two sets of scales are reported in Table 5.8. To aid in the interpretation of the results, the 24 OVIS scales have been grouped, on the basis of scale descriptions and item content, according to ACT Interest Inventory scale categories. Scales not easily classified were assigned to the miscellaneous category.

With few exceptions the OVIS scales correlate most highly with the corresponding ACT Interest Inventory scales. For example, the OVIS Clerical Work Scale correlates .70 with the ACT Interest Inventory Business Detail Scale and the OVIS Management and Supervision Scale correlates .59 with the ACT Interest Inventory Business Contact Scale. This level of correlation between scales is reasonably high, considering the relatively long interval between administrations and the contrasting rationales on which the instruments are based.

Occasionally, relatively high correlations between an OVIS scale and more than one ACT Interest Inventory scale were obtained. Usually, however, these correlations are in accordance with expectations; e.g., OVIS Management and Supervision with ACT Interest Inventory Business Contact and Business Detail, OVIS Medical with ACT Interest Inventory Science and Social Service, and OVIS Applied Technology with ACT Interest Inventory Science and Technical.

In general, the pattern of correlations between these two sets of measures provides evidence of both convergent and divergent validity.

Measures of Other Career-related Noncognitive Variables

Experience measures. Since people apparently seek out activities that they find interesting, one would expect to observe positive correlations between measures of interests and experiences. Table 5.9 presents correlations between ACT Interest Inventory scales and the experience scales included in the lower-level ACT CPP (ACT, 1974). The correlations are based on the scores of 930 11th graders randomly sampled from the ACT CPP national norm group. For males, the correlations between corresponding scales range from .34 to .62 (median of .54). For females, the range is .21 to .58 (median of .49). Results for a nationally representative sample of 8th graders (not shown) are similar (ACT, 1974). Across the two studies, the correlations between divergent experience and interest scales are higher than the correlations between corresponding scales in only 3 of 120 instances.

Additional evidence of the type cited above is provided by the correlations between ACT Interest Inventory scales and the Experience Scales for the upper-level ACT CPP. These data, reported in the handbook for the ACT CPP (ACT, 1977, p. 40), are for a sample of juniors and seniors in ten high schools. Correlations between corresponding scales for 744 males range from .28 to .60 (median of .48) and for 829 females range from .34 to .54 (median of .40). The correlations between corresponding scales are higher than those between divergent scales in all but 1 of the 60 comparisons.

In summary, it appears that people who express an interest in particular activities tend to report participation in such activities to a greater degree than they do in unrelated areas. This is evidence both of the construct validity and the usefulness of the interest scales.

Out-of-class accomplishments. One would expect to find a positive relationship between interests and achievements in a given area for much the same reason that a positive relationship between interests and experiences is expected. Individuals with a strong interest in an area are likely to pursue related activities until certain goals or standards are met. Information regarding the relationship between achievements and interests for AAP registrants is provided through comparison of ACT Interest Inventory scores with scores on the AAP Out-of-Class Accomplishment (OCA) Scales. The OCA Scales, a component of the Student Profile Section of the AAP, assess specific, nonacademic achievements in nine areas. For example, accomplishments in music are evaluated with items such as "Participated in a state music contest," and "Performed in a school musical group."

Correlations between the ACT Interest Inventory and the OCA Scales were reported by Hanson (1974, pp. 24-25) for a

TABLE 5.7

Correlations between ACT Interest Inventory and Kuder General Interest Survey Scales
(8-week Interval)

	ACT Interest Inventory scales					
Kuder scales	Social Service	Business Contact	Business Detail	Technical	Science	Creative Arts
Social Service	<u>46</u>	-03	-15	-15	-16	-07
Persuasive	04	<u>40</u>	10	-10	-19	-11
Clerical	-14	12	<u>43</u>	-09	-21	-35
Computational	-02	14	<u>43</u>	-04	09	-19
Mechanical	-20	-19	-16	<u>58</u>	00	-06
Outdoor	-15	-25	-14	30	-11	-18
Scientific	06	-02	-07	05	<u>55</u>	01
Artistic	-12	-10	-18	08	03	<u>52</u>
Literary	14	06	-02	-34	10	<u>31</u>
Musical	-05	00	-14	-16	01	<u>31</u>
Mean[a]	4.3	4.8	4.9	5.5	4.8	4.8
SD	1.9	1.8	1.9	2.0	1.9	2.0

Note. Correlations (decimal points omitted) are based on a combined-sex sample of 243 ninth graders (ACT, 1974, p. 84). Kuder scores were converted from percentile ranks to stanines prior to computing correlations. Results for similar scales are underlined.

[a]Based on stanine scores, using norms from the ACT CPP (lower-level edition).

TABLE 5.8

Correlations between ACT Interest Inventory and Ohio Vocational Interest Survey Scales
(8-week interval)

OVIS scales grouped according to ACT Interest Inventory scale categories	ACT Interest Inventory scales					
	Social Service	Business Contact	Business Detail	Technical	Science	Creative Arts
Social Service scales						
(4) Caring for people	55	26	14	21	19	16
(9) Nursing and related technical services	58	29	17	12	38	18
(23) Teaching, counseling, and social work	53	52	29	23	36	41
Business Contact scales						
(3) Personal services	17	41	42	15	-05	13
(8) Customer services	29	60	54	25	11	24
(10) Skilled personal services	20	29	23	19	05	31
(17) Promotion and communication	44	57	35	22	37	36
(18) Management and supervision	26	59	46	30	31	26
(20) Sales representative	21	57	44	30	29	20
Business Detail scales						
(5) Clerical work	06	39	70	-01	-07	04
(13) Numerical	07	29	44	20	34	02
Technical scales						
(1) Manual work	00	28	22	40	05	14
(2) Machine work	03	28	13	56	17	11
(6) Inspecting and testing	04	37	26	35	08	16
(7) Crafts and precise operations	09	36	21	59	27	25
(15) Agriculture	08	14	07	46	19	01
Science scales						
(16) Applied technology	20	36	21	45	48	33
(24) Medical	52	33	09	21	52	26
Creative Arts scales						
(12) Literary	37	50	28	19	33	50
(19) Artistic	30	34	17	27	27	68
(21) Music	30	36	14	22	21	51
(22) Entertainment and performing arts	40	43	14	22	18	50
Miscellaneous						
(11) Training	43	52	28	37	29	40
(14) Appraisal	28	42	22	39	54	27
Mean[a]	4.1	5.1	5.1	4.7	4.8	4.4
SD	1.6	1.9	1.9	1.6	1.8	1.8

Note. Correlations (decimal points omitted) are based on a combined-sex sample of 271 ninth graders (ACT, 1974, pp. 84-85). Results for similar scales are underlined.

[a]Based on stanine scores, using norms from the ACT CPP (lower-level edition).

TABLE 5.9

Correlations between ACT Interest Inventory Scales and the Experience Scales from the ACT CPP (Lower-Level Version)

	Experience scales					
Interest scales	Science	Creative Arts	Social Service	Business Contact	Business Detail	Technical
Science	62(58)	30(26)	23(17)	21(19)	38(21)	16(21)
Creative Arts	31(28)	60(57)	32(19)	28(13)	26(10)	11(17)
Social Service	27(29)	34(22)	51(47)	33(33)	24(22)	-03(16)
Business Contact	23(22)	31(21)	37(40)	44(35)	34(24)	05(21)
Business Detail	20(-05)	22(-04)	29(07)	25(07)	34(21)	-01(03)
Technical	07(26)	08(23)	09(15)	05(07)	13(18)	57(51)

Note. Correlations (decimal points omitted) are based on the scores of 462 males and 468 females—a 10% sample of the approximately 9,300 members of the CPP national norm group (ACT, 1974, pp.78-80). Results for females are reported in parentheses.

TABLE 5.10

Correlations of the ACT Interest Inventory Scales with High School Grades, ACT Test Scores, and Out-of-Class Accomplishments Scales for College-bound Males

			ACT Interest Inventory scales					
Variables	Mean	*SD*	Science	Creative Arts	Social Service	Business Contact	Business Detail	Technical
Out-of-class accomp.								
Athletics	3.1	1.9	00	-03	14	14	04	12
Work experience	3.2	2.0	02	11	09	20	04	13
Practical skills	2.8	1.6	20	16	09	14	09	33
Leadership	1.9	1.8	14	23	30	20	03	-01
Music	1.7	2.0	12	32	10	09	04	-02
Speech	0.9	1.3	07	32	22	20	04	-06
Art	0.7	1.2	07	26	06	02	-06	10
Writing	0.9	1.2	14	36	22	12	00	-09
Science	0.8	1.2	31	12	04	-01	00	08
High school grades								
English	2.9	0.8	20	15	03	-04	02	-08
Mathematics	2.6	1.0	29	-02	-05	-10	11	00
Social Studies	3.1	0.8	21	07	03	-01	04	-07
Natural Sciences	2.8	0.9	33	01	-05	-10	01	-02
Average GPA	2.8	0.7	34	06	-02	-09	06	-05
AAP scores								
English	18.4	5.0	21	15	-04	-13	-01	-13
Mathematics	22.2	6.8	36	01	-09	-13	12	-02
Social Studies	20.6	6.9	26	15	00	-05	-01	-12
Natural Sciences	23.7	6.0	38	13	-06	-14	-04	-02
Composite	21.4	5.4	36	12	-05	-12	02	-08

Note. Correlations (decimals omitted) are based on a random sample of 1,430 male registrants for the October 1972 AAP national test date (Hanson, 1974, pp. 22-25).

sample of AAP registrants. Results are shown in Table 5.10 for the 1,430 males and in Table 5.11 for the 2,009 females. The correlations are generally low (usually less than .30), but do show some convergent and divergent validity (e.g., see results for the Science and Creative Arts Scales). The generally low correlations may be due, in large part, to two factors. First, since the OCA scales were developed to identify individuals who had demonstrated superior achievements, most students score low on most scales. Consequently, the distribution of scores for these measures is highly skewed, thereby limiting the magnitude of the correlations which can be obtained. Second, interest in an area is but one of many factors related to success in that area. Other factors, such as ability, opportunities for participation, and motivation, may be at least as important.

Measures of Academic Ability and Achievement

The relationship between interests and abilities has been reviewed and summarized in most texts describing tests used in guidance (e.g., Super & Crites, 1962; Goldman, 1971; Anastasi, 1976). In general, only a low to moderate relationship has been found. In a study by Hanson (1974, pp. 22-25), the ACT Interest Inventory was correlated with self-reported high school grades and the academic ability measures in the AAP. The results, based on the same college-bound sample used in the interest and accomplishments comparisons, are also shown in Tables 5.10 and 5.11. Only the Science Scale correlated consistently with high school grades and AAP test scores, and these correlations are all below .40. The highest Science Scale correlations are with natural science grades, overall grade point average, and natural science test scores. Similar results were obtained when the ACT Interest Inventory Scales were correlated with the ability scales in the lower-level version of the ACT Career Planning Program (ACT, 1974, p. 78).

Summary

Intercorrelations of the ACT Interest Inventory scales were examined to assess correspondence with the pattern of

TABLE 5.11

Correlations of the ACT Interest Inventory Scales with High School Grades, ACT Test Scores, and Out-of-Class Accomplishments Scales for College-bound Females

			ACT Interest Inventory scales					
Variables	Mean	*SD*	Science	Creative Arts	Social Service	Business Contact	Business Detail	Technical
Out-of-class accomp.								
Athletics	1.9	1.4	06	03	10	05	00	07
Work experience	2.2	1.9	03	07	11	15	08	06
Practical skills	3.1	1.2	14	18	11	14	05	12
Leadership	2.0	1.7	15	18	16	17	-02	03
Music	2.2	1.9	03	21	00	-03	-05	-02
Speech	1.0	1.3	08	25	12	16	-04	01
Art	0.9	1.2	08	31	02	03	-07	15
Writing	1.3	1.3	09	34	11	12	-06	01
Science	0.5	0.9	23	08	05	03	-02	08
High school grades								
English	3.2	0.8	14	10	-03	-03	-02	01
Mathematics	2.7	1.0	16	-06	-08	-05	15	03
Social Studies	3.2	0.8	18	08	00	-03	00	05
Natural Sciences	2.9	0.8	24	00	-06	-09	03	05
GPA	3.0	0.7	23	03	-06	-07	06	04
AAP scores								
English	19.8	4.9	15	20	-09	-12	-08	02
Mathematics	19.6	6.9	28	08	-10	-10	04	09
Social Studies	19.2	7.1	25	21	-02	-07	-11	07
Natural Sciences	20.9	6.1	28	17	-08	-13	-11	09
Composite	20.0	5.4	29	19	-08	-12	-07	08

Note. Correlations (decimals omitted) are based on a random sample of 2,009 female registrants for the October 1972 AAP national test date (Hanson, 1974, pp. 22-25).

scale interrelationships defined by Holland's (1973) hexagonal model. Correspondence was high: in general, scales representing adjacent corners on the hexagon correlated most highly with each other and scales representing opposite corners had very low intercorrelations.

Results of principal components analyses and analyses yielding data/ideas and things/people theory-based factors supported the validity and generalizability of the theory-based factors. The data/ideas and things/people factors accounted for nearly the same proportions of variance as the principal components (approximately 60% of the variance not accounted for by response set). Plots of the loadings on the two theory-based factors reproduced the hexagonal configuration with nearly equal distance between scales and with the scales arranged in the expected order.

Correlations between parallel scales on the ACT Interest Inventory and other inventories assessing Holland's types were at least as high as the correlations typically found between parallel scales on these other inventories. (The highest correlations occurred when persons were tested concurrently with the two instruments; somewhat lower correlations were obtained in studies employing a "test-retest" design.) Divergent validity was demonstrated through markedly lower correlations between nonparallel scales. As expected, correlations were found to decrease as the ACT Interest Inventory scales were compared with decreasingly similar measures, such as relevant scales of interest inventories not assessing Holland's types, measures of experience, out-of-class accomplishments, academic achievement, and career-related abilities.

CHAPTER 6

CRITERION-RELATED VALIDITY: GROUP PROFILES AND HIT RATES

At last count, 29 studies have been performed in which the criterion-related validity of the ACT Interest Inventory was assessed. (Appendix C provides profile summaries for more than 40,000 persons in 352 criterion groups.) Both longitudinal and cross-sectional designs have been used, and samples have included high school students, community and 4-year college students, and employed adults.

Most of the studies have been performed as part of ACT's Vocational Interest Research Program. Such studies generally involve persons from a variety of locations. However, studies have also been conducted at the local level by university/college staff involved in the admissions and guidance process and by graduate students writing theses and dissertations.

Typical study procedures and results are summarized in this chapter and in Chapter 7. Presented first is research that provides qualitative evidence of ACT Interest Inventory validity in the form of various types of criterion group profiles. The second section of the chapter provides evidence of a quantitative nature. In addition, numerical indices of the criterion-related validity of the ACT Interest Inventory are compared with indices for other, similar instruments. Since there are no absolute standards for judging validity, such comparisons provide a useful perspective for viewing results for the ACT Interest Inventory.

Criterion Group Profiles

Illustrative Profiles

A straightforward procedure for demonstrating validity at the qualitative level is to examine the interest score profiles for various criterion groups formed by selecting individuals with the same occupational choice, educational major, or occupation. Criterion group profiles are determined by computing and graphing mean interest scores for each group and examining the graphs to see if they conform to the configuration expected on the basis of theory (e.g., Holland's theory of careers) and common sense. Students majoring in biology, for example, should score highest on the ACT Interest Inventory Science Scale, whereas students majoring in accounting should score highest on the Business Detail Scale. To the extent that criterion group profiles conform with expectations, evidence of criterion-related validity is provided.

Examples of profiles obtained from two longitudinal studies are presented in Figure 6.1. (The profiles were selected to cover similar career areas for each study and to represent each of Holland's six types.) The sample for the first study (described by Prediger & Lamb, in press) consisted of 12,738 college seniors enrolled at 16 universities in 15 states. Approximately 11,000 of these seniors could be classified into 53 criterion groups on the basis of college major. The interest scores used to generate the profiles were those the seniors received 4 years earlier as college-bound students. The sample in the second study (described by Prediger & Lamb, 1979) consisted of approximately 1,100 employed college alumni grouped by ACT job family (Prediger, 1976b). Interest scores were those the alumni received 4 years earlier as college seniors. After deleting records of alumni who reported dissatisfaction with their occupations, data were available for 11 job families with at least 20 members in each family.

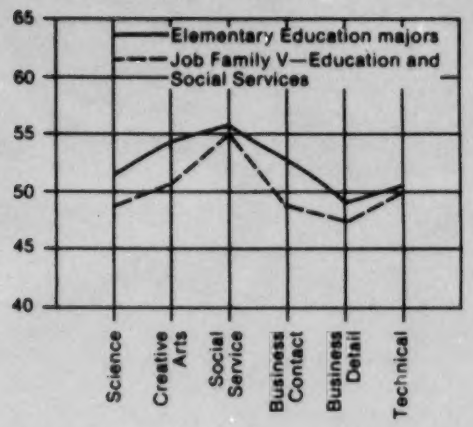
Figure 6.1 shows that, for both studies, the profiles generally conform to expectations. For example, alumni employed in natural science and mathematics occupations and college seniors majoring in biology have their highest and second highest mean scores on the Science and Technical Scales and their lowest score on the Business Contact Scale. Figure 6.1 also illustrates that ACT Interest Inventory criterion group profiles tend to be consistent across various samples and criterion group definitions (e.g., college major, occupation).

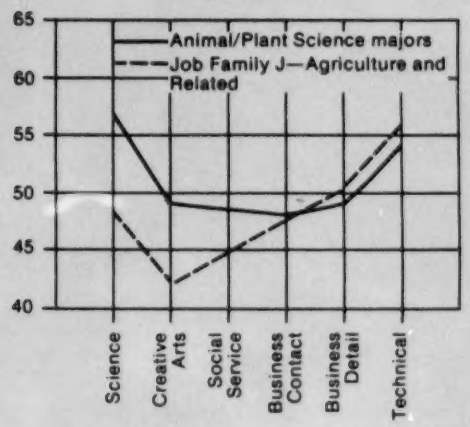
Profile Summaries for 352 Criterion Groups

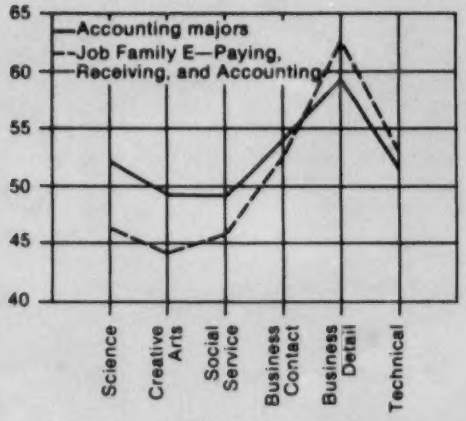
A convenient method for presenting profiles of criterion groups is provided by the high-point code system. In this system, a criterion group's profile is represented by a three-letter code in which each letter represents a Holland type, as defined in Chapter 1. The three letters in the code indicate, respectively, the scales with the highest, second-highest, and third-highest mean scores.

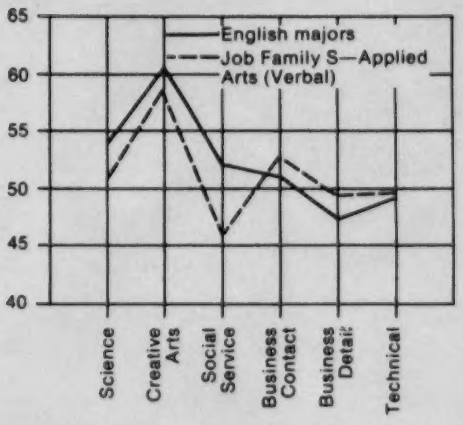
An example of study results presented in three-letter code format is shown in Table 6.1. In this study, Wallace (1978) obtained mean UNIACT scores for seniors in 24 different majors at the University of Southern Mississippi. The codes generally conform to expectation. The highest mean interest score for seniors majoring in accounting, for example, is on the Business Detail Scale (Holland code of "C"), and the second and third highest scores, respectively, are on the Business Contact ("E") and Technical ("R") Scales.

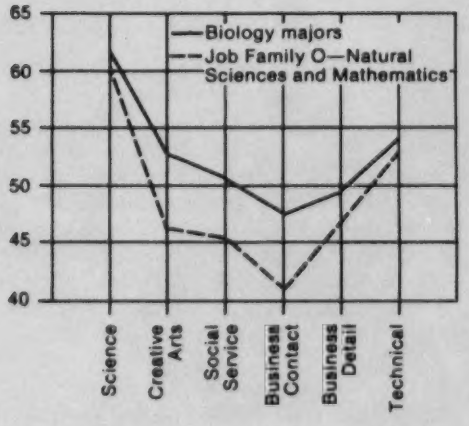
Results of similar studies, both concurrent and longitudinal, are presented in Appendix C. Summed over all studies, ACT Interest Inventory profiles are presented for over 40,000 persons in 352 occupations and educational groups. Criterion group data are organized according to the occupational clusters used in the ACT Occupational Classification System (Prediger, 1976b) mentioned previ-











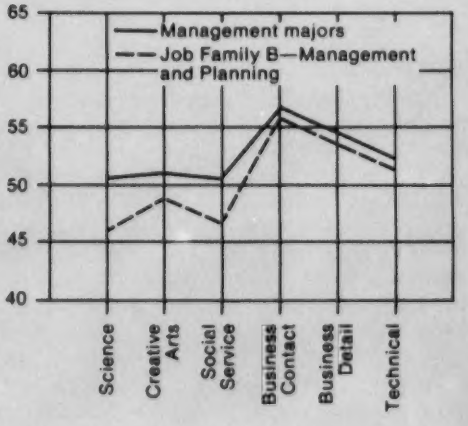


Figure 6.1. Mean ACT Interest Inventory profiles of college seniors (solid lines) tested as high school seniors, and college alumni (broken lines) tested as college seniors.

ously. The clusters resemble Holland's six clusters but use type of work and work setting rather than psychological traits as the primary basis for classification. Thus, similar occupations with dissimilar high-point codes are not scattered across clusters as in Holland's (1973) system (e.g., see Holland's codes for psychologist and sociologist; for industrial, mechanical, and chemical engineers). Instead, occupations closely related in terms of field of work are grouped together, thus making it easier for the user of the classification system to obtain an overview of the world of work.

Criterion group data in Appendix C are reported separately by sex whenever the data are available separately. This is important because some reporting procedures produce substantially different interest profiles for males and females pursuing the same occupation. As discussed in Chapter 2, the differences typically conform to sex-role stereotypes. Common sense suggests, however, that if interests represent basic and useful constructs of human behavior, persons pursuing the same occupation should have similar interests. As proposed by Prediger and Hanson (1976) and confirmed by Holland (1976), this observation is implicit in Holland's theory of careers. The data in Appendix C provide no evidence of systematic, stereotypic differences in the 3-letter codes of males and females pursuing similar occupations and educational majors. Hence, these data support the construct validity of the sex-balanced scales used in UNIACT.

A detailed analysis of the 3-letter codes obtained by the 352 criterion groups is left to the reader. With few exceptions, the codes make good sense, especially when considered in the context of sample sizes and the diverse sources of many of the criterion groups. The codes for similar criterion groups generally involve the same combination of scales from study to study and for males and females. Differences in the scale sequence within a 3-letter code are often due to relatively minor variations in scale means. Codes based on concurrent data are highly similar, in most cases, to those based on longitudinal data. Considered together, the data summarized in Appendix C and the data in the original studies appear to provide substantial evidence of the criterion-related validity of UNIACT scales.

Map of College Majors Profiles

Additional evidence of ACT Interest Inventory validity is provided by the Map of College Majors (Figure 1.5), printed on the back of the AAP Student Profile Report. The map shows locations of 34 different 4-year college criterion groups and 18 2-year college criterion groups as deter-

TABLE 6.1

UNIACT Profiles of College Seniors Expressed as Three-Letter Holland Codes

Academic major	*N*	Holland code	Academic major	*N*	Holland code
Accounting	81	CER	Math./computer science	67	CIR
Arts (fine and applied)	62	ARS	Marketing	52	EAR
Biological sciences	51	IRS	Music education	58	ASR
Business, general	112	ECS	Nursing	113	ISA
Business education	23	ECS	P.E., health, recreation	84	RSA
Communications	41	AES	Physical sciences	34	IRA
Elementary education	94	SAE	Political sci./criminal justice	90	ESR
English/literature	22	AES	Psychology	33	SAI
Health services	54	ISA	Social sciences	60	SAR
Home economics	59	EAS	Sociology	30	SEA
History	30	ASE	Special education	58	SAR
Industrial ed./technology	65	REI	Speech/hearing	27	SAE

Note. Codes are based on UNIACT scores of seniors at the University of Southern Mississippi (Wallace, 1978).

mined from ACT Interest Inventory scores obtained prior to college. Each group's location is indicated by its mean things/people score (its "X" coordinate) and its mean data/ideas score (its "Y" coordinate). Mean scores on these two bipolar dimensions, described in Chapter 1, are based on weighted components of a group's mean scores on the six basic interest scales (see Appendix E).

Sample. Locations of the 4-year college majors were determined from the interest scores of approximately 9,200 of the 12,738 college seniors in the study by Prediger & Lamb (in press) cited above. The 16 institutions attended by these seniors, located in 15 states, were selected because a high percentage of the entering class participated in the AAP. Data were obtained by requesting the institutions to provide senior class rosters which indicated the major of each individual. The ACT Interest Inventory scores that these seniors received 4 years earlier, when most were high school seniors, were retrieved by matching these rosters against files maintained at ACT. Since this group was limited to students who had achieved senior status within four years of enrollment, the study design included an indirect screen for success and satisfaction; that is, these individuals had not lost time completing their degree programs due to inadequate grades, nor had their progress been delayed by substantial changes in career goals.

Data for the 2-year college majors were obtained in a similar manner. Student rosters indicating program of enrollment were provided by nine community colleges in nine states. Precollege interest scores for approximately 6,300 of these students enrolled in 18 majors were retrieved from ACT files. All of the 2-year college majors were vocational/technical programs (e.g., automotive/diesel technology, dental hygiene/assisting) intended to prepare enrollees for immediate entry into the labor force following a maximum of 2 years of study.

For both the 4-year and 2-year college samples, majors were included on the map only if data were available for a minimum of 75 students. For 46 of the 52 majors, data were available for 100 or more students. Thus, the large sample sizes provide assurance that the locations of the majors are relatively stable.

Map locations were determined separately by sex for majors with sufficient numbers of males and females. The similarity of results for males and females indicated that combined-sex criterion groups provided a good summary of the data. Accordingly, the majors were located on the map on the basis of data for the combined-sex groups.

Inter-institutional analyses. In developing the Map of College Majors, data for the same majors at different institutions were combined. Thus, there was an assumption that inter-institutional differences in ACT Interest Inventory profiles for the various majors were minimal. If substantial inter-institutional differences were found, a single Map of College Majors would not be appropriate for general use.

An analysis by Hanson (1974) of data for a sample of approximately 12,000 college seniors attending 32 colleges and universities provides one source of evidence that ACT Interest Inventory profiles are consistent across institutions. The institutions in Hanson's study were selected to be representative nationally with respect to institutional size, geographic region, and type of control. Multiple discriminant analysis was used to determine whether students in the same major attending different institutions could be differentiated by the six ACT Interest Inventory scales. Results of the discriminant analysis and a visual inspection of profiles indicated that inter-institutional differences were relatively small in comparison to inter-major differences.

A similar inter-institutional analysis was conducted for the vocational, technical, and transfer programs pursued by 2-year college students in the national norms sample of the upper-level ACT CPP. The results, reported in the *Handbook for the ACT Career Planning Program* (ACT, 1977, pp. 60-62), are consistent with those reported above for 4-year college students.

Finally, evidence of consistency in ACT Interest Inventory profiles for academic majors across institutions was also obtained from the longitudinal data collected during the development of the current Map of College Majors. Profiles for each major/program were generated for each institution. These profiles were compared and only minor variations were noted among institutions. Thus, the comparability of profiles across institutions has been established with both cross-sectional and longitudinal data from a variety of 2-year and 4-year institutions.

Results for majors. The sensible locations of the criterion groups on the Map of College Majors (Figure 1.5) provide substantial evidence of ACT Interest Inventory validity. Accounting, for example, is located nearest the data pole of the data/ideas dimension, whereas various science majors and majors related to art and music are located nearest the ideas pole. On the things/people dimension, engineering and technology majors are nearest the things pole, whereas social service and education-related majors are nearest the people pole. A more detailed inspection of the map is left to the reader.

Quantitative Summaries of Criterion-related Validity

The techniques for determining ACT Interest Inventory validity described above are qualitative in nature, in that each criterion group in the various studies was evaluated independently in terms of the consistency of its profile with expectations based on theory and common sense. Although different methods were used to judge the appropriateness of the individual group profiles (graphs, three-letter codes, and locations on the Map of College Majors), results of a study as a whole could not be summarized quantitatively. Consequently, these evaluation procedures do not readily permit the direct comparison of the criterion-related validity of different interest inventories.

Two closely related analyses, which are frequently employed in quantitatively assessing the validity of instruments assessing basic types of vocational interests, are presented in this section. As noted in Chapter 2, both procedures are closely related to a central principle in Holland's (1973) theory of careers.

Agreement of Criterion Group Type and Predominant Interests

According to Holland's theory, I-type interests (i.e., scientific interests) should predominate among I-type criterion groups (e.g., biology majors, employed chemists); A-type (artistic) interests should predominate among A-type criterion groups (e.g., musicians, writers) and so on. (The correspondence of Holland's interest types to the ACT Interest Inventory scales is discussed in Chapter 1; abbreviations are also provided.) In assessing interest inventory validity, each sample member is classified on the basis of occupation (or academic major) into one of six criterion groups corresponding to Holland's interest types. The predominant interest type for each criterion group is then determined from the interest scale with the highest mean score. The extent of agreement between Holland types, as determined from criterion group membership and predominant interests, provides an index of criterion-related validity. Because of its basis in Holland's theory of careers, the index also provides evidence relevant to construct validity.

The validation approach described above, which has been used extensively by Walsh and his colleagues (e.g., Bingham & Walsh, 1978), was employed in four ACT Interest Inventory validity studies (Lamb & Prediger, 1979—two studies; Prediger & Lamb, 1979; Prediger & Lamb, in press). On the basis of college major, occupational preference, or occupation, participants in these studies were assigned to criterion groups corresponding to the six Holland interest types. In each study, there were 12 criterion groups, 6 for each sex. Participants were college-bound students tested concurrently (N = 1,589), college seniors tested concurrently (N = 1,962), college seniors tested 4 years previously as college-bound students (N = 11,395), and college alumni tested 4 years previously as college seniors (N = 1,101). In determining agreement between Holland type and predominant interests, mean interest scores were computed to a tenth of a standard score unit. There were no tied mean scores.

Across the 48 criterion groups, Holland type and predominant interests agreed in all but 5 instances (2 for males and 3 for females), a 90% agreement rate. In four of the five instances of disagreement, the predominant interests of the criterion group were adjacent on the hexagonal model to the interests expected to predominate for the group.

Because the ACT Interest Inventory was constructed to assess interests corresponding to Holland's (1973) six interest types, perspective on the agreement rates cited above is perhaps best provided by comparisons with results for the SDS—the instrument most recently developed by Holland to assess the types (1973, p. 19). In six studies completed by Walsh and his associates (see Prediger, 1980a, for a compilation), the SDS was administered to 717 adults in 34 occupational groups (14 male and 20 female). The mean ages of occupational group members ranged from 34 to 40 and the mean length of time in occupation ranged from 3 to 23 years. Occupational membership and SDS scores were obtained concurrently in all six studies. In general, the circumstances were favorable for achieving positive results. Predominant interests were determined by Walsh and his associates from the mean SDS raw scores for each occupational group. (The SDS reports raw scores rather than standard scores). Each Holland type was represented by at least five groups. Across the 34 occupational groups, Holland type and predominant interests agreed in 16 instances (a 47% agreement rate). Thus, the agreement rate for the ACT Interest Inventory was nearly twice as high.

Criterion Group Hit Rates Based on High-point Codes

Procedure and rationale. In the second type of quantitative analysis commonly employed to assess criterion-related validity, "hit rates" are computed. The procedure, as applied to the Holland (1973) typology, also requires that each study participant be classified into one of Holland's six types on the basis of occupation or academic major. A person's criterion group is counted as being correctly identified (a "hit") if the person's high-point code (interest scale with the highest score) matches the criterion group. Thus, a biology student would be included in Holland's Investigative (Science) criterion group and would be counted among the hits if his or her highest score were on the Investigative (Science) scale. The percentage of individuals who are hits (the "hit rate") is then computed for each of the six criterion groups. Finally, the hit rates are averaged across the criterion groups to obtain a summary index of validity for Holland's six types. (The rationale for this method of summarizing validity is discussed by Prediger, 1977.)

As noted in Chapter 2, the validation model described above is consistent with the primary counseling use of interest inventories (i.e., to identify personally relevant career options). In effect, this approach to validation asks whether persons in a given criterion group would have been referred to that group by their interest scores.

An example of the use of this procedure is provided in the study by Prediger and Lamb (in press) cited previously in this chapter. Approximately 11,000 college seniors, for whom precollege ACT Interest Inventory scores had been retrieved, were assigned to criterion groups corresponding to Holland's types on the basis of academic major. Average hit rates, shown in Table 6.2, are 40% and 36% for males and females, respectively—appreciably higher than the 17% chance hit rate expected for an inventory providing random scores.

Summary of results. The above technique for assessing ACT Interest Inventory validity has been employed in seven published studies, four of longitudinal design. Results of these studies, which involved over 29,000 persons, are summarized in Table 6.3. For males, average hit rates range from 38% to 55% and for females they range from 36% to 51%. Average hit rates are not strictly comparable between studies, since some studies have five criterion groups and others have six. However, the base rates—20% versus 17%—are similar enough that direct comparisons seem justified in the interest of simplicity. As would be expected, the higher hit rates generally were achieved in the concurrent studies.

Average hit rates are usually higher for males than females. However, this finding should not be interpreted as sug-

gesting that validity is higher for males, as the composition of the criterion groups was not identical for both sexes. For example, the social criterion groups for females, but not males, contained a high proportion of persons majoring, or employed, in elementary education.

Comparison with results for other interest inventories. Perspective on the magnitude of the hit rates reported in Table 6.3 might best be obtained from comparisons with data for other instruments assessing Holland's types. Such data are rereported in Table 6.4. Studies were included in the table if hit rates were reported separately for criterion groups representing at least five of Holland's types. A minimum of 10 cases in a criterion group was required. (In the five studies that met these screening criteria, the SDS and the VPI were the only instruments represented.) The average hit rates for males range from 34% to 51%. For females, the average hit rates for the two studies meeting the screening criteria were 33% and 37%. Thus, hit rates for the ACT Interest Inventory appear to be at least as high as those typically reported for the SDS and the VPI when data are available for at least five criterion groups.

Criterion Group Hit Rates Based on Discriminant Analysis

A variation of the hit rate procedure described above involves the use of multiple discriminant analysis and centour scores (Cooley & Lohnes, 1971). If Holland's typology is the basis of the criterion group formation, the procedure is essentially similar to that described previously. However, the entire score profile rather than the high-point code is used to determine whether an individual should be classified as a hit. For each individual, a centour (i.e., similarity) score is computed for each criterion group. The highest centour, based on the interest scores, is then compared with criterion group membership.

The above procedure was used by Hanson and Rayman (1976) to compute hit rates for a preliminary edition of UNIACT. Average hit rates for the sample of 1,902 college-bound students were 39% for males (6 criterion groups) and 40% for females (5 criterion groups). Thus, results were comparable to those reported in studies listed above. Possibly, use of a preliminary form of UNIACT mitigated the effectiveness of the more sophisticated analysis procedure.

An advantage of the discriminant analysis approach to hit rate analysis is that one is not restricted to the use of criterion groups that directly correspond to interest scales. Any number of criterion groups can be formed, with centour scores used to indicate the similarity of an individual's profile to the profile of each group. Hanson (1974, pp. 50-51), for example, determined hit rates for a sample of 1,534 college seniors in 24 different majors. A "hit" was defined as occurring if one of an individual's five highest centour scores corresponded to his or her actual major. Using this criterion, the average cross-validated hit rate across the criterion groups was 47%. (Hanson did not report results separately by sex.)

A similar analysis (ACT, 1977, pp. 66-71) was performed on data for 1,421 males and 1,698 females in the national norm group for the upper-level ACT CPP. The criterion groups (17 male and 16 female) consisted of community college students enrolled in various programs. The hit rates for both males and females averaged about 40% as determined by the correspondence between criterion group membership and the first and second highest centour scores. Because these results were not based on a cross-validation sample, some shrinkage in the hit rate might be expected upon cross-validation.

TABLE 6.2

ACT Interest Inventory Hit Rates for College Seniors

	Males		Females	
Criterion group	*N*	Hit rate	*N*	Hit rate
Investigative	2,008	51%	999	54%
Artistic	778	47	1,353	42
Social	621	26	2,343	22
Enterprising	1,147	32	414	29
Conventional	457	48	297	41
Realistic	835	38	143	27
Total *N* and average hit rate[a]	5,846	40	5,549	36

Note. Based on a sample of seniors (described by Prediger & Lamb, in press) who had been tested 4 years previously as college-bound students. In determining the highest interest score for an individual, score ties were broken randomly.

[a]The average of the individual criterion group hit rates.

Summary

A wide variety of evidence related to the criterion-related validity (and, by implication, construct validity) of the ACT Interest Inventory was presented in this chapter. This evidence is based on results of both cross-sectional and longitudinal studies conducted in conjunction with the ACT Vocational Interest Research Program and by university/college staff at individual institutions. The basic types of evidence are listed, in capsule form, below.

1. Profiles for 352 criterion groups, representing ACT Interest Inventory data for over 40,000 persons, generally make good sense. There is no evidence of systematic stereotypic differences in the codes of males and females pursuing similar occupations and educational majors.
2. Locations of the various academic majors on the Map of College Majors are consistent with the definitions of the map dimensions and the profiles for a given major are similar at different institutions.

3. The predominant interests of criterion groups, as determined from ACT Interest Inventory scores, agreed with the criterion group's Holland type for 90% of the comparisons. A 47% agreement rate was obtained in similar studies with another instrument designed to assess Holland's types.

4. Criterion group hit rates for the ACT Interest Inventory were generally between two and three times the chance hit rate. These hit rate values were shown to be as high or higher than those achieved in similar studies with other instruments assessing Holland's types.

TABLE 6.3

Summary of Criterion Group Hit Rate Data for the ACT Interest Inventory

Study	Type	Sample	Criterion; No. of criterion groups	Average hit rate[a]	
				Males	Females
Hanson, Noeth, & Prediger (1977)	Longitudinal (5 years)	Young adults;[b] M=648, F=424	Occ. status; M=6, F=5	38	44
Hanson, Noeth, & Prediger (1977)	Longitudinal (2 years)	College sophomores;[b] M=549, F=894	College major; M=5, F=5	43	39
Prediger & Hanson (1977)	Concurrent	College seniors; M=5,517, F=5,061	College major; M=5, F=5	55	51
Lamb & Prediger (1979)	Concurrent	College-bound students; M=737, F=852	Occ. preference; M=6, F=6	46	38
Lamb & Prediger (1979)	Concurrent	College seniors; M=929, F=1,033	College major; M=6, F=6	50	46
Prediger & Lamb (1979)	Longitudinal (4 years)	Employed college alumni;[b] M=896, F=405	Occ. status; M=6, F=6	50	44
Prediger & Lamb (in press)	Longitudinal (4 years)	College seniors;[b] M=5,846, F=5,549	College major; M=6, F=6	40	36

[a]The average of the individual criterion group hit rates.

[b]Status at the time of follow-up.

TABLE 6.4

Summary of Criterion Group Hit Rate Data for Other Interest Inventories Assessing Holland Types

Study	Instrument	Type	Sample	Criterion; No. of criterion groups	Average hit rate[b]	
					M	F
Osipow & Ashby (1968)	VPI	Concurrent	College freshmen; M=670, F=89	Occupational choice; M=6, F=1	41	—
Holland & Lutz (1968)	VPI	Longitudinal (8 months)	College freshmen; M=1,119, F=504	Occupational choice; M=6, F=4	51	—
Gottfredson & Holland (1975b)	SDS	Longitudinal (3 years)	College juniors;[a] M=702, F=557	Occupational choice; M=6, F=5	34	33
Gottfredson & Holland (1975b)	SDS	Longitudinal (1 year)	College freshmen;[a] M=192, F=432	Occupational choice; M=5, F=3	34	—
Salomone & Slaney (1978)	VPI	Concurrent	Employed nonprofessional; M=470, F=447	Occupation; M=6, F=6	34	37

Note. Table lists only studies in which (a) hit rates were reported separately for each criterion group, and (b) $N \geq 10$ for at least five groups for at least one sex.

[a]Participants were entering college students when tested.

[b]Average of the individual criterion group hit rates.

CHAPTER 7

OTHER INDICATORS OF CRITERION-RELATED VALIDITY

The first section of this chapter applies validation procedures proposed by Strong (1943) to longitudinal data for the ACT Interest Inventory. Analyses of these data, collected by Prediger and Lamb (in press), were reported in Chapter 6. However, Strong's validation procedures provide a somewhat different perspective for examining validity.

The second section of this chapter applies validation procedures which use as criteria (a) satisfaction with academic major, (b) persistence in college, and (c) persistence in academic major. Data sources are the Prediger and Lamb study cited above, and a study conducted outside ACT. The satisfaction and persistence criteria deserve more attention and will be the subject of further study as part of ACT's Vocational Interest Research Program.

Analyses Based on Strong's Propositions

Strong (1943) proposed that for an interest inventory to be valid its scores must be related to an individual's eventual occupational choice. This criterion led to his four specific propositions regarding interest inventory validity which, as rephrased by Campbell (1977), are:

1. People continuing in an occupation should obtain a higher interest score on it than on any other occupation.
2. People continuing in an occupation should obtain a higher interest score on it than people entering [continuing in] some other occupation.
3. People continuing in an occupation should obtain higher scores on it than people who change from that occupation to some other.
4. People changing from some other occupation to occupation X should score higher on X *prior to the change* than they did on the other occupation. (p. 65)

Although studies based on these propositions require longitudinal data, Strong's validation studies were not literally "predictive," as has sometimes been assumed. That is, Strong did not predict future occupation and then determine the accuracy of the predictions. Instead, Strong used longitudinal data to determine whether various occupational groups scored according to the expectations stated by his propositions. In this respect, his approach to validation is highly similar to ACT Interest Inventory validation procedures described in Chapter 6.

Campbell (1977) has summarized the results of criterion-related validity studies involving one or more of Strong's propositions. Findings have been generally positive for the first three propositions; however, the fourth has received little support. In the study described below, the four propositions provided models for a longitudinal study of ACT Interest Inventory validity. College major, rather than occupation, served as the dependent variable.

Sample

Data were initially collected for 12,738 college seniors attending 16 colleges in 15 states (Prediger & Lamb, in press). As described in Chapter 6, precollege interest scores and precollege choice of academic major were obtained from ACT files and the college major of each senior was provided by the institution. On the basis of college major, each senior was assigned to one of six criterion groups corresponding to Holland's (1973) six types. (For consistency, groups were given names corresponding to the six ACT Interest Inventory scales.) Majors (e.g., "general studies," "liberal arts") of 1,343 of the students could not be classified in this manner and, hence, these individuals were excluded from the study. A further 3,689 students were eliminated from the analyses because, when the interest inventory was taken, they either did not specify a major, or they chose a major too general to classify into one of the six types. Thus, the study sample consisted of 7,706 seniors (4,035 males and 3,671 females) with both initial and final majors classified by Holland type.

Analyses and Results

Proposition 1. People continuing in an occupation should obtain a higher interest score on it than on any other occupation. As demonstrated by Strong (1943), Proposition 1 can be evaluated in terms of mean scores. For example, the Science criterion group should have its highest mean interest score on its "own scale" (the Science Scale).

The 4,481 students (2,220 males and 2,261 females) who had the same initial and final Holland classification were defined as "continuing" for the purposes of the analysis. Each criterion group's mean *T* score (mean = 50, SD = 10) was calculated for each of the six scales. Results are presented in Table 7.1. For both sexes, each criterion group scored higher on its own scale than on the other five scales. Differences between own scale mean and other scale means (30 comparisons) range from 2 to 17 standard score units for males and from 1 to 19 units for females, with a median difference of about 10 standard score units (1 SD) for both males and females.

Proposition 2. People continuing in an occupation should obtain a higher interest score on it than people entering (continuing in) some other occupation. Again, these analyses involved group mean scores for the 4,481 students with the same initial and final Holland classification. Mean scores on the relevant scale for members of each criterion

group (major) are compared with those of nonmembers in Table 7.2. For both sexes, each criterion group scored higher on its own scale than did the other groups. The range of score differences is 6 to 15 *T*-score units for males and 7 to 15 units for females. The median difference is about 9 *T*-score units for both sexes.

The mean scores for members of each criterion group can be compared with those of each of the other criterion groups separately by examining Table 7.1. These comparisons indicate a tendency for more closely related groups (e.g., Social Service and Business Contact) to obtain more similar scores than do groups farther apart on Holland's hexagonal model (e.g., Social Service and Technical). However, in every case the criterion group has a higher score on its own scale than does any one of the other criterion groups.

An interesting alternative analysis, indirectly related to Proposition 2, is to compare the percentage of students scoring highest on their own scale with the percentage of all other students scoring highest on that (for them, inappropriate) scale. These comparisons are shown in Table 7.3. For each of the criterion groups, the percentage of members

TABLE 7.1

Mean Interest Scores of Students Continuing in a Particular Major

	Criterion group (Major)											
	Science		Creative Arts		Social Service		Business Contact		Business Detail		Technical	
Interest scale	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*
						Males						
Science	60.6	6.9	50.0	8.3	48.3	7.3	49.0	8.3	48.7	8.6	54.9	7.5
Creative Arts	52.0	8.2	60.7	8.0	54.8	8.8	51.8	8.3	48.3	7.6	49.5	8.4
Social Science	49.4	8.2	52.7	8.3	58.9	7.1	51.9	8.3	49.0	8.0	48.0	8.3
Business Contact	47.5	8.2	50.8	9.4	53.7	8.4	59.6	9.1	56.3	8.7	47.2	9.5
Business Detail	51.4	8.4	48.5	8.9	49.5	8.2	54.4	8.7	65.5	6.4	49.2	8.0
Technical	52.4	8.7	49.5	9.6	48.5	9.2	49.8	9.3	50.8	8.5	57.3	8.4
N	1,241		373		146		219		69		172	
						Females						
Science	64.5	7.5	51.1	8.5	52.7	9.0	50.8	9.8	47.2	8.2	60.3	8.7
Creative Arts	52.6	9.0	61.2	8.1	53.5	9.2	51.9	7.8	49.6	9.2	50.8	9.3
Social Service	46.8	9.6	49.2	9.0	56.6	9.1	46.5	10.4	47.5	8.0	45.5	9.8
Business Contact	47.4	8.8	52.1	9.8	52.9	9.3	58.3	9.9	56.4	8.4	42.7	7.5
Business Detail	50.1	8.4	47.1	8.3	48.5	8.2	53.9	7.8	63.5	6.1	48.7	6.3
Technical	55.7	10.1	52.4	10.3	51.2	10.6	52.9	11.6	49.3	10.8	61.2	10.2
N	475		615		1,085		27		43		16	

Note. Standard scores, mean of 50 and standard deviation of 10, are based on norms for college-bound students. Means that are expected to be highest are underlined.

scoring highest on their own scale substantially exceeds that of members of the other five groups.

Table 7.3 also shows the ratio of the percentages explained above. This ratio ranges from about 4 to 9 for the six male groups, and from about 3 to 14 for the six female groups. Among males, for example, science majors are approximately six times more likely than other college seniors to obtain their highest score on the Science Scale. Across all six criterion groups the ratio was 5.1 for males and females combined.

Proposition 3. People continuing in an occupation should obtain higher scores on it than people who change from that occupation to some other. Table 7.4 presents comparisons of mean scores of the 4,481 students who continued in a major with the 3,225 who did not. With no exceptions, continuing students had higher mean scores on their own scale than students who changed to a different major. Thus, Proposition 3 is confirmed for all groups. Additionally, for 10 of the 12 criterion groups, the larger the change (across the hexagon) the lower the mean score on initial major.

Proposition 4. People changing from some other occupation to occupation X should score higher on X prior to the change than they did on the other occupation. Proposition 4 suggests that students who change majors should score higher on the scale corresponding to their *final* Holland criterion group than on the scale corresponding to their group at the time of testing. This sample included 3,225 students who changed to majors of a different Holland type. As shown by Table 7.5, only the groups changing majors to the science category had an appreciably higher mean score on the corresponding scale of the interest inventory than on the scale corresponding to their initial major. (For four other groups, mean scores for the initial and final choices varied less than one-tenth of a standard deviation.) Overall, results are not in accordance with Proposition 4.

Discussion

In this study, Propositions 1-3 were supported by the data, while, generally, Proposition 4 was not. These results are similar to those obtained by Strong (1943) and Strong and Tucker (1952). A possible reason for the lack of support for

TABLE 7.2

Mean Interest Scores of Criterion Group Members and Nonmembers on Interest Scale Appropriate for Criterion Group Members

Criterion group (Major)	Males			Females		
		Interest scores			Interest scores	
	N	Mean	*SD*	*N*	Mean	*SD*
Science						
Members	1,241	60.6	6.9	475	64.5	7.5
Nonmembers	979	50.3	8.3	1,786	52.0	8.9
Creative Arts						
Members	373	60.7	8.0	615	61.2	8.1
Nonmembers	1,847	51.8	8.3	1,646	53.1	9.1
Social Service						
Members	146	58.9	7.1	1,085	56.6	9.1
Nonmembers	2,074	50.1	8.4	1,176	48.0	9.3
Business Contact						
Members	219	59.6	9.1	27	58.3	9.9
Nonmembers	2,001	48.8	8.9	2,234	51.5	9.6
Business Detail						
Members	69	65.5	6.4	43	63.5	6.1
Nonmembers	2,151	50.9	8.6	2,218	48.6	8.3
Technical						
Members	172	57.3	8.4	16	61.2	10.2
Nonmembers	2,048	51.3	9.1	2,245	52.5	10.6

Proposition 4 across the various studies is that many persons who change their occupations or majors may do so for reasons other than interests (e.g., skills, economic realities).

It should be noted that the validation criteria, as stated in Propositions 1 and 2, differ from those of the usual longitudinal study, in which there is no requirement that the persons involved have *continued* in the occupation that they were pursuing, or planning to pursue, at the time of initial testing. Members of a continuing group are apt to be more committed to their occupational choice, on the average, than persons who have made their choice at a later time. One would expect such a group to obtain higher scores on the interest scale corresponding to their own occupational area than a group not screened for persistence. For instance, the female science criterion group in this study has a mean score of 64.5 on the appropriate scale. When all women in the sample who were majoring in science as seniors are used as the criterion group, the corresponding mean score is 61.8.

This study differs from Strong's studies in that college majors, rather than occupations, were used to define criterion groups. Furthermore, criterion groups and interests were reported by the six Holland types rather than by specific occupations. In spite of these differences, the overall results for the four propositions are similar to those obtained by Strong.

Satisfaction and Persistence Criteria

Satisfaction with College Major

It seems logical to expect that greater satisfaction should be associated with congruence between a person's vocational interests and choice of occupation. Indeed, a positive relationship between satisfaction and interest/occupational congruence was postulated over 30 years ago by Strong (1943) and is an expectation in Holland's (1973) theory of careers. Numerous studies, typically using a vocational interest inventory to assess interests and questionnaire items to assess satisfaction, have been performed to investi-

TABLE 7.3

Percentage of Criterion Group Members and Nonmembers with Highest Interest Score on Scale Corresponding to Criterion Group

	Males			Females		
Criterion group (Major)	*N*	% scoring highest on scale	Ratio[a]	*N*	% scoring highest on scale	Ratio[a]
Science			5.9			4.8
Members	1,241	58.7		475	66.3	
Nonmembers	979	10.0		1,786	13.9	
Creative Arts			5.1			4.0
Members	373	55.2		615	54.0	
Nonmembers	1,847	10.8		1,646	13.6	
Social Service			6.9			8.1
Members	146	41.1		1,085	30.7	
Nonmembers	2,074	6.0		1,176	3.8	
Business Contact			8.2			3.3
Members	219	49.8		27	40.7	
Nonmembers	2,001	6.1		2,234	12.2	
Business Detail			8.8			14.0
Members	69	78.3		43	62.8	
Nonmembers	2,151	8.9		2,218	4.5	
Technical			3.5			2.8
Members	172	43.6		16	43.8	
Nonmembers	2,048	12.4		2,245	15.5	

[a]Ratio of percentage for criterion group members to percentage for nonmembers.

gate such a relationship. However, as noted by Spokane and Derby (1979) and by Wiener and Klein (1978), both positive and negative findings have been reported in these studies.

Various explanations can be offered for the negative findings in studies correlating measures of interest/occupational congruence with satisfaction. For example, persons engaged in an occupation tend to be homogeneous with respect to satisfaction and interest and, hence, the magnitude of the correlation which can be obtained between satisfaction and interest/occupational congruence may be attenuated. (The reports cited above discuss additional considerations.) Nevertheless, a positive relationship would provide support for the validity and usefulness of an interest inventory.

Wallace (1978) used UNIACT to examine the relationship of congruence between interests and academic major (to be termed "interest/major congruence") and satisfaction with academic major for 1,400 college seniors at the University of Southern Mississippi. When the seniors took UNIACT, they also responded to the following request regarding satisfaction with their academic major: "Please indicate which statement best describes how you feel about your current major." The six response options ranged from "It is a major that I strongly dislike and I wish I could leave for some other," to "The major is exactly what I want to do and I am very satisfied with it." On the basis of their responses, students were divided into a satisfied group (N = 1,299) and a dissatisfied group (N = 101). The seniors were also classified as having interests congruent (N = 598) or

TABLE 7.4

Mean Interest Scores on Scales Corresponding to Initial Major Area for Students Making No Change, a Small Change, or a Large Change in Eventual Classification

Initial major area	No change			Small change			Large change		
	N	Mean	*SD*	*N*	Mean	*SD*	*N*	Mean	*SD*
				Males					
Science	1,241	60.6	6.9	517	58.2	6.8	441	56.3	7.4
Creative Arts	373	60.7	8.0	97	58.9	8.5	89	56.0	8.0
Social Service	146	58.9	7.1	80	56.3	8.0	123	54.5	8.4
Business Contact	219	59.6	9.1	141	58.2	8.3	116	55.7	9.7
Business Detail	69	65.5	6.4	39	64.2	7.9	14	58.7	7.4
Technical	172	57.3	8.5	78	55.2	8.7	80	57.0	7.9
				Females					
Science	475	64.5	7.5	149	63.0	7.2	319	60.2	8.2
Creative Arts	615	61.2	8.1	271	59.4	7.9	47	57.7	7.5
Social Service	1,085	56.6	9.1	252	53.8	9.3	192	53.0	9.3
Business Contact	27	58.3	9.9	46	57.4	9.1	48	58.2	8.8
Business Detail	43	63.5	6.1	25	61.4	5.7	32	60.6	8.2
Technical	16	61.2	10.2	9	58.7	10.7	20	53.9	12.3

Note. The "no change" group includes seniors whose Holland classification of present major was the same as that of their precollege major choice. The "small change" and "large change" groups include seniors for whom precollege and present majors were located on adjacent corners, and nonadjacent or opposite corners, respectively, of Holland's hexagonal model.

incongruent (N = 802) with their academic major by computing, from their UNIACT profiles, the probability of membership in each academic major criterion group. The percentages of satisfied and dissatisfied seniors with congruent and with incongruent interests are shown in Table 7.6. The positive relationship between interest/major congruence and satisfaction is statistically significant at the .01 level.

Persistence in College

Wallace also sought to determine whether there was a relationship between interest/major congruence and persistence in college. ACT Interest Inventory scores were retrieved for 301 entering freshmen whose status 3 years later could be established. Of these individuals, 118 had "persisted" (had graduated or were still enrolled) and 183 had withdrawn. The interest profile of each person was classified as being either congruent or incongruent with freshman academic major, using the same procedure followed in the satisfaction-congruence study.

Although there was a tendency for persisting students to have more congruent profiles, the association between congruence and persistence was not statistically significant. This finding may not be surprising, since numerous factors other than interest in major are involved in college persistence (e.g., financial status, academic capabilities, satisfaction with college social life). Nevertheless, interest/major congruence should play a role in persistence to the extent that congruence is related to satisfaction. Thus, Wallace's results suggest new areas for ACT Interest Inventory research.

TABLE 7.5

Mean Interest Scores (of Students Changing Major Area) on Scales Corresponding to Initial and Final Choice of Major

Final major area	*N*	Interest scores on scale corresponding to: Initial major Mean	*SD*	Final major Mean	*SD*
Males					
Science	238	54.7	8.8	55.9	7.9
Creative Arts	213	57.8	7.6	57.8	8.1
Social Service	258	58.2	8.7	55.8	8.3
Business Contact	430	57.1	7.5	54.0	9.0
Business Detail	183	57.6	7.8	55.9	9.0
Technical	493	57.4	7.3	57.0	9.1
Females					
Science	204	55.3	9.3	57.2	9.0
Creative Arts	341	57.3	9.6	57.4	9.3
Social Service	478	59.5	8.0	50.8	9.3
Business Contact	183	58.0	9.3	54.4	9.6
Business Detail	123	56.5	10.1	56.6	8.5
Technical	81	60.1	8.9	57.4	9.4

TABLE 7.6

Percentage of Seniors Satisfied and Dissatisfied with Their Major by Interest/Major Congruency Status

Interest/major congruency	Satisfied	Dissatisfied
Congruent	44%	30%
Incongruent	56%	70%
N	1,299	101

Note. $Chi^2 = 7.002$ ($p < .0082$). Results are based on data for University of Southern Mississippi seniors, reported by Wallace (1978).

Persistence in Major

Wallace's data suggest that there is a relationship between interest/major congruence and satisfaction with major. Presumably, then, students are more likely to remain in their original major area if their interest/major congruence is high. The data used in the study of Strong's propositions (described earlier in this chapter) have been analyzed to determine the relationship between interest/major congruence and persistence in major.

As shown at the bottom of Table 7.7, four levels of congruence were used. Overall, higher levels of congruence were associated with persistence in major. Across all six major areas, 37% of the males at the lowest level of congruence persisted in their major until their senior year; 67% of those at the highest level did so. The corresponding percentages for females are 54% and 68%. Thus, the percentages of males and females persisting in their majors increases 81% (30/37) and 26% (14/54) as one moves from the lowest to the highest levels of interest/major congruence.

Although it appears that females are more likely to remain in incongruent majors than males, it should be noted that if the social service area is excluded only 38% of females remain in incongruent majors. It may be that many women remain in traditionally female social service occupations (such as elementary education), even though their interests are incongruent, because of societal expectations or because of the opportunities these occupations offer for reentry and geographic mobility.

TABLE 7.7

Percentage of Seniors Persisting in Their Major by Interest/Major Congruency Status

Congruence level	Criterion group (planned major)							Initial *N*
	Science	Creative Arts	Social Service	Business Contact	Business Detail	Technical	All majors	
				Males				
1	70[a]	76	56	57	61	58	67	1,846
2	50	64	46	40	48	57	51	895
3	44	63	37	37	57	42	45	613
4	36	46	26	38	29	46	37	681
Initial *N*	2,199	559	349	476	122	330	4,035	
				Females				
1	59	70	83	30	49	50	68	1,522
2	45	65	71	24	45	31	60	830
3	38	60	70	17	20	39	58	518
4	29	54	62	16	27	14	54	801
Initial *N*	943	933	1,529	121	100	45	3,671	

Note. Level of congruence was determined as follows: Level 1—planned major same Holland code as highest interest score; level 2—planned major same Holland code as second highest interest score; level 3—planned major same Holland code as third highest interest score; level 4—planned major not same Holland code as any of the three highest interest scores.

[a]This percentage represents the ratio of these numbers: Denominator: Number of males initially planning science majors who had a congruence index of 1 (*N* = 1,050); Numerator: Number of individuals in this group who were seniors majoring in science four years later (*N* = 732).

CHAPTER 8

APPROPRIATENESS FOR MINORITY GROUP MEMBERS

Interest inventories commonly used in the United States, including UNIACT, were developed and validated with samples of primarily white, middle-class Americans. Thus, one might question whether these interest inventories are appropriate for members of racial/ethnic minority groups who may have different cultural and/or socioeconomic backgrounds. Some minority group members, for example, may not have had opportunities to engage in the activities named in the inventory items or may place different values on these activities.

The possibility that interest inventories may be less valid for minority populations has been investigated in numerous studies. Although not conclusive, results of these studies (reviewed by Harrington & O'Shea, 1980) suggest that interest inventories are usually about as valid for minority group members as for the general population. Evidence specific to the ACT Interest Inventory is summarized in this chapter. Topics include reliability, sex balance, factor structure, and criterion-related validity.

The main evidence summarized in this chapter is provided for an "in-general" sample of college-bound individuals (all 1,247 males and 1,693 females in the UNIACT AAP norms sample, described in Chapter 3) and for Black (85 male and 139 female) and Spanish-American (36 male and 59 female) members of this in-general sample. (Spanish-American members include individuals who identified themselves on their AAP registration materials as Mexican American, Chicano, Puerto Rican, or Spanish-speaking American.) Some additional evidence from previously published studies (Lamb, 1976; Scott & Anadon, 1980) is also cited in this chapter.

Reliability

If some of the items on a UNIACT scale have different meanings or are unclear to members of a minority group, the internal consistency estimate of reliability would be expected to be lower for that group. Table 8.1 provides internal consistency estimates of reliability for the in-general, Black, and Spanish-American samples described above. (The in-general sample data are those provided in Chapter 4.) Coefficient alpha estimates are reported for the basic interest scales. For reasons noted in Chapter 4, split-half estimates are reported for the Data/Ideas and Things/People Summary Scales.

The reliability values for the Spanish-American sample are comparable to those of the in-general sample. In fact, the median values for the separate-sex samples for these two groups are identical (all four values are .86). Although the reliability estimates are slightly lower for the Black sample (medians of .84 for males and .82 for females), differences are so small that they are unlikely to be of any practical consequence. For the types of scores reported to persons taking UNIACT (*T*-scores ± 1 SEM, World-of-Work Map regions), it would appear that reliability is adequate both for general populations and for the minority groups represented in the study.

Sex Balance

A primary goal in the development of UNIACT was the construction of scales based on items which are equally appealing to males and females. The resulting score

TABLE 8.1

Internal Consistency Estimates of UNIACT Reliability

	Blacks		Spanish Americans		In-general sample	
Scale	M	F	M	F	M	F
Science	91	91	94	93	93	92
Creative Arts	86	86	88	88	88	88
Social Service	81	82	88	85	84	81
Business Contact	79	82	81	87	84	83
Business Detail	85	86	85	89	88	90
Technical	84	80	84	83	83	85
Data/Ideas	85	83	82	83	88	88
Things/People	75	72	87	70	78	76
Median values	84	82	86	86	86	86
N	85	139	36	59	1,247	1,693

Note. Reliabilities (decimals omitted) are based on coefficient alpha estimates for the six basic interest scales and split-half estimates for the Data/Ideas and Things/People Summary Scales.

distributions have a high degree of male-female overlap (see Chapter 4). The extent of male-female overlap also is an important consideration in evaluating the appropriateness of the UNIACT for minority group members. As noted in Chapter 3, if overlap is greater than 75% (Dunnette, 1966) to 80% (Strong, 1955), distributions should not be considered dissimilar.

Male-female overlap percentages are presented in Table 8.2 for the Black, Spanish-American, and in-general samples. To provide perspective on the magnitude of the means, data are expressed in *T*-score units based on UNIACT AAP norms. As expected, the overlap values for the in-general sample are nearly identical to the raw-score-based values cited for this sample in Chapter 4.

For the eight UNIACT scales, the percentage of overlap is highly similar for all three samples. Although values on individual scales are, in some cases, higher for one group than another, these differences do not systematically favor any particular group. The range of overlap percentages for the in-general samples is 80% to 98% (median of 90%), and ranges for the Black and Spanish-American samples are, respectively, 76% to 98% (median of 90%), and 91% to 100% (median of 96%). All values exceed the Dunnette-Strong criteria.

Table 8.2 also indicates that there are some differences in mean scores between the two minority samples and the in-general sample. The average of the absolute differences in *T*-score means for the Black and in-general samples is 1.5 (range 1.2 to 2.2) for males and 2.1 (range .5 to 3.7) for females. For the Spanish-American and in-general samples, these absolute differences are 1.6 (range .2 to 4.6) for males and .9 (range 0 to 2.8) for females. Differences of this magnitude were also observed in a study of ACT Interest Inventory profiles for Native American (N = 499) and white (N = 394) college students (Scott & Anadon, 1980). In that study, mean ACT Interest Inventory score differences between groups were found to be statistically significant, although the investigators concluded that the differences were not large enough to be of practical significance.

An explanation for the observed differences in mean interest scores cited above cannot be ascertained from the data. The score differences may, in fact, accurately reflect real differences in the career interests of ethnic/minority group members who plan to attend college. Although it is possible that factors unrelated to interests interact with racial/ethnic background in determining item response patterns, none of the evidence presented in this chapter suggests this to be the case. However, this topic deserves further study.

Factor Structure

UNIACT factor structure is reported in this section for the Black, Spanish-American, and in-general samples. (Analysis procedures were described in the section on factor structure in Chapter 5.) Consistency of factor structure across samples would suggest that UNIACT assesses the same constructs for minority and in-general samples.

In Chapter 5, it was shown that the data/ideas and things/people theory-based dimensions accounted for a substantial proportion of the total score variance for the UNIACT AAP norms sample (the in-general sample). Results of that analysis are reported again in Table 8.3 with data for the Black and Spanish-American samples. For the data/ideas dimension, findings are highly similar across the three samples. However, the things/people dimension accounts for somewhat less variance for Blacks.

A final indication of the correspondence between the UNIACT scale structure and theoretical expectations was provided in Chapter 5 through plots of the scale loadings on the theory-based data/ideas and things/people dimensions. The plots—shown again in Figure 8.1 for the in-general sample—conform closely to the hexagonal model. Plots for Blacks and Spanish Americans, also shown in Figure 8.1, generally correspond to those for the in-general sample. Correspondence is best for the Creative Arts, Social Service, Business Contact, and Business Detail Scales. The Science and Technical Scales show the most variation across the three groups.

Lamb (1978) examined interest scale structure for the following samples of college seniors: Blacks (N = 365), Spanish Americans (N = 310), Native Americans (N = 65), Oriental Americans (N = 203), and White/Caucasians (N = 1,337). Scale intercorrelations for each sample were subjected, separately by sex, to an analysis of spatial configuration (Cole & Cole, 1970). With one exception (Native American males), the scale structure was similar for all groups for both sexes. For Native American males, the Social Service Scale was not located in accordance with expectations based on Holland's hexagonal model.

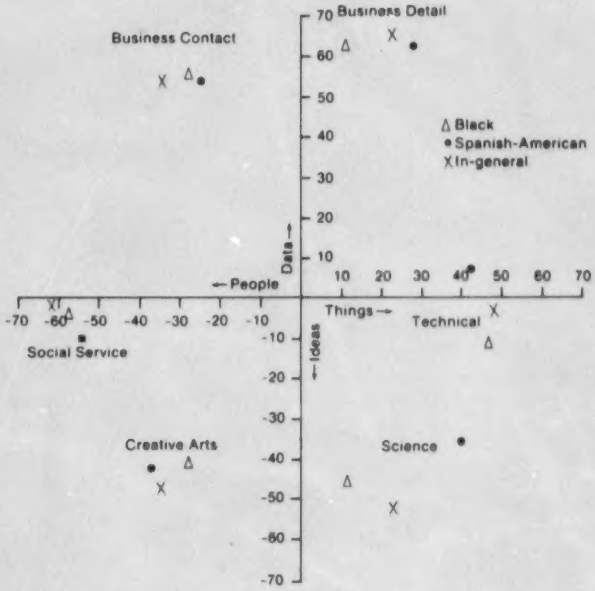


Figure 8.1. Plot of UNIACT Theory-based Loadings for Black (*N*=224), Spanish-American (*N*=95), and in-general (*N*=2,940) samples.

TABLE 8.2

Male-Female Score Overlap for Black, Spanish-American, and In-general Samples

Scale	Males		Females		Percent overlap[a]
	Mean	*SD*	Mean	*SD*	
			Blacks (M=85, F=139)		
Science	49.8	9.0	50.2	9.9	98
Creative Arts	49.9	9.1	51.9	9.2	91
Social Service	50.1	9.6	54.5	10.0	82
Business Contact	51.6	8.8	53.7	10.0	91
Business Detail	51.2	8.9	54.0	8.9	88
Technical	51.7	10.0	48.3	9.1	86
Data/Ideas	51.6	9.1	52.8	9.2	95
Things/People	51.1	9.2	45.7	8.3	76
			Spanish Americans (M=36, F=59)		
Science	51.2	10.7	50.8	9.7	98
Creative Arts	48.4	9.6	50.9	9.9	90
Social Service	52.6	11.2	52.8	9.9	99
Business Contact	52.9	8.7	49.9	11.4	88
Business Detail	51.0	8.2	50.3	10.5	97
Technical	52.6	10.4	51.6	10.5	96
Data/Ideas	50.4	7.8	50.3	9.0	100
Things/People	51.3	11.3	49.0	9.1	91
			In-general sample (M=1,247, F=1,693)		
Science	51.0	9.7	49.3	10.2	93
Creative Arts	48.2	9.7	51.3	10.0	88
Social Service	48.0	10.2	51.5	9.5	86
Business Contact	49.8	9.9	50.2	10.0	98
Business Detail	49.6	9.4	50.3	10.5	97
Technical	51.7	9.5	48.8	10.3	88
Data/Ideas	49.4	9.8	50.4	10.2	96
Things/People	52.9	9.9	47.9	9.5	80

[a]Based on Dunnette's (1966) table for Tilton's (1937) measure of overlap.

Criterion-related Validity

Lamb (1978) also reported criterion-related validity data for the Black (N = 365), Spanish American (N = 310), Native American (N = 65), Oriental American (N = 203), and White/Caucasian (N = 1,337) college senior samples cited in the previous section. The original edition of the Map of College Majors (Hanson, 1974) was used in assessing validity. Each individual's position was located on the map, and the 24 majors on the map were ranked according to similarity of location to the individual. (Similarity was assessed by calculating linear distance on the map between the location of a major and the individual's location.) Each major had previously been assigned to one of four general fields of study. If the individual's actual field of study was the same as the first field of study to appear on the ordered list, a "hit" was tallied. If, however, the individual's field did not appear on the list until all other fields had been named, a "clean miss" was tallied.

Comparisons of the percentages of hits and clean misses for the white and minority samples are presented in Table 8.4. In general, the percentage of hits and clean misses for the minority samples does not differ by more than a few percentage points from the percentage for the white sample. For males, the overall percentage of hits is lowest for the Spanish-American sample (41%), but only eight percentage points below the white sample (49%). The percentage of clean misses ranges from 10% for the Native American males to 5% for Oriental American and white males. For females, the percentage of hits is actually lowest (44%) in the white sample. Minority sample values for this index range from 48% to 61%. The percentage of clean misses ranges from 2% to 5%.

The criterion-related validity of ACT Interest Inventory scores for college-bound Native American students was also assessed in the Scott and Anadon (1980) study cited in a previous section. Two analyses were conducted. In the first, interest profiles were classified as being congruent or incongruent (on a four-point scale) with preferred academic major. Results from this analysis indicated only small differences in level of congruence between the Native American and white groups. In the second analysis, each student's World-of-Work Map region, obtained from the ACT Interest Inventory, was compared with the World-of-Work Map region corresponding to the student's occupational choice. For 49% of the Native American females and 51% of the white females, these two regions on the World-of-Work Map were either the same, adjacent, or separated by (at most) one region. For males, the corresponding values (58% for Native American and 76% for white students) were more discrepant. However, Scott and Anadon considered a difference of this magnitude to be of no practical consequence for counseling purposes, especially in light of the results for their first analysis.

In summary, the criterion-related validity evidence presented above suggests that the ACT Interest Inventory is about as valid for minority group members as for other individuals. Although one of two analyses in the Scott and Anadon (1980) study suggested somewhat lower validity for Native American than for white males, differences in validity were minimal in the other analysis reported in that study. In the Lamb (1978) study, only small differences in criterion-related validity were observed in results of the separate-sex analyses performed on samples of Black, Spanish American, Native American, Oriental American, and White/Caucasian college seniors. Overall, the criterion-related validity evidence is consistent with that provided in previous sections of this chapter in demonstrating the appropriateness of the ACT Interest Inventory for use with minority populations.

TABLE 8.3

Percentage of Variance Accounted for by Data/Ideas (D/I) and Things/People (T/P) Theory-based Dimensions

	Blacks	Spanish Americans	In-general sample
D/I factor	33	32	34
T/P factor	22	28	26
N	224	95	2,940

Note. Percentages indicate the proportion of variance accounted for after variance associated with the response set factor is removed.

TABLE 8.4

Comparison of White and Minority College Seniors on Percentage of Hits and Clean Misses

	White/ Caucasian		Black		Spanish American		Native American		Oriental American	
	M	F	M	F	M	F	M	F	M	F
Hits	49%	44%	46%	50%	41%	48%	45%	61%	56%	53%
Clean misses	5	5	8	2	7	4	10	0	5	3
N	759	578	145	220	190	120	42	23	101	102

Note. Data for 2,280 college seniors attending 32 colleges and universities are taken from Lamb (1978).

Appendix A

THE ACT VOCATIONAL INTEREST RESEARCH PROGRAM: LIST OF REPORTS

An informal program of research on vocational interest assessment and related topics has existed at ACT for a number of years. Studies primarily involved the construction of new instruments, the refinement of Holland's system for classifying occupations, and analyses of the basic structure of vocational interests. Much of this early work, together with related studies, is reported in *The Vocational Interests of Young Adults*, ACT Monograph 11, 1973, edited by Hanson and Cole.

Early in 1972, with the decision of ACT to include a vocational interest inventory in the ACT Assessment Program (AAP), a formal program of research on interest assessment was begun. The general focus has been on scales assessing basic types of human interests. This appendix lists 30 publications prepared in conjunction with ACT's program of research on vocational interests. The following topics have received primary attention:

A. The definition and determination of sex bias in interest inventories.

B. The viability of various procedures for reporting interest scores (e.g., sex-balanced vs. sex-restrictive scales, profiles based on same-sex vs. combined-sex norms) and for determining the validity of interest scores.

C. Basic dimensions of work tasks and work-related activity preferences (interests) associated with occupations and people.

D. The relationship of interests to various educational and occupational criteria.

E. Determination of the effects of interest inventories on students.

The most relevant topics are indicated for each of the publications listed. Publications are arranged in approximate chronological order within the following two sections: Reports of research; Discussion of issues and problems.

Reports of Research

	Topic
Hanson, G. R. *Assessing the career interests of college youth: Summary of research and applications* (ACT Research Report No. 67). Iowa City, Iowa: The American College Testing Program, 1974.	C,D
Rayman, J. Sex and the single interest inventory: The empirical validation of sex-balanced interest inventory items. *Journal of Counseling Psychology*, 1976, *23*, 239-246.	B,D
Prediger, D. J., & Hanson, G. R. Holland's theory of careers applied to women and men: Analysis of implicit assumptions. *Journal of Vocational Behavior*, 1976, *8*, 167-184.	B,D
Prediger, D. J. A world of work map for career exploration. *Vocational Guidance Quarterly*, 1976, *24*, 198-208.	C,D
Prediger, D. J. The viability of Holland's consistency construct and raw score assessments of personality. *Measurement and Evaluation in Guidance*, 1976, *9*, 124-131.	B,D
Hanson, G. R., & Rayman, J. Validity of sex-balanced interest inventory scales. *Journal of Vocational Behavior*, 1976, *9*, 279-291.	B,D
Prediger, D. J., McLure, G. T., & Noeth, R. J. *Promoting the exploration of personally relevant career options in science and technology* (NSF Grant No. SM175-18149 A01). Iowa City, Iowa: The American College Testing Program, October, 1976.	E
Hanson, G. R., Prediger, D. J., & Schussel, R. H. *Development and validation of sex-balanced interest inventory scales* (ACT Research Report No. 78). Iowa City, Iowa: The American College Testing Program, 1977.	B,D
Prediger, D. J., & Hanson, G. R. Some consequences of using raw score reports of vocational interests. *Journal of Educational Measurement*, 1977, *14*, 323-333.	B,D
Hanson, G. R., Noeth, R. J., & Prediger, D. J. The validity of diverse procedures for reporting interest inventory scores: An analysis of longitudinal data. *Journal of Counseling Psychology*, 1977, *24*, 487-493.	B,D

Prediger, D. J., & Hanson, G. R. Must interest inventories provide males and females with divergent vocational guidance? *Measurement and Evaluation in Guidance*, 1978, *11*, 88-98. B,D

Lamb, R. R. Validity of the ACT Interest Inventory for minority group members. In C. K. Tittle & D. G. Zytowski (Eds.), *Sex-fair interest measurement: Research and implications* (National Institute of Education Report). Washington, D.C.: U.S. Government Printing Office, 1978. D

Prediger, D. J., & Noeth, R. J. Effectiveness of a brief counseling intervention in stimulating vocational exploration. *Journal of Vocational Behavior*, 1979, *14*, 352-368. E

Lamb, R. R., & Prediger, D. J. Criterion-related validity of sex-restrictive and unisex interest scales: A comparison. *Journal of Vocational Behavior*, 1979, *15*, 231-246. B,D

Prediger, D. J., & Johnson, R. W. *Alternatives to sex-restrictive vocational interest assessment* (ACT Research Report No. 79). Iowa City, Iowa: The American College Testing Program, 1979. A,B,D

Prediger, D. J., & Lamb, R. R. The validity of sex-balanced and sex-restrictive vocational interest reports: A comparison. *Vocational Guidance Quarterly*, 1979, *28*, 16-24. B,D

Prediger, D. J. Basic vocational interest scales: The problem of sex restrictiveness and alternatives. In B. Gutek (Ed.), *New directions for education, work, and careers: Enhancing women's career development*. San Francisco, Calif.: Jossey-Bass, 1979. A,B,D

Lamb, R. R., & Prediger, D. J. Construct validity of raw score and standard score reports of vocational interests. *Journal of Educational Measurement*, 1980, *17*, 107-115. B,D

Prediger, D. J. The determination of Holland types characterizing occupational groups. *Journal of Vocational Behavior*, 1980, *16*, 33-42. B,D

Prediger, D. J., & Lamb, R. R. Four-year validity of Holland types for college-bound males and females. *Journal of College Student Personnel*, in press. B,D

Discussions of Issues and Problems

Prediger, D. J., & Hanson, G. R. The distinction between sex restrictiveness and sex bias in interest inventories. *Measurement and Evaluation in Guidance*, 1974, *7*, 96-104. A,B

Cole, N. S., & Hanson, G. R. Impact of interest inventories on career choice. In E. E. Diamond (Ed.), *Issues of sex bias and sex fairness in career interest measurement* (National Institute of Education Report). Washington, D.C.: U.S. Government Printing Office, 1975. B,D

Prediger, D. J., & Cole, N. S. Sex-role socialization and employment realities: Implications for vocational interest measures. *Journal of Vocational Behavior*, 1975, *7*, 239-351. B,D

Prediger, D. J., & Hanson, G. R. *Evidence related to issues of sex bias in interest inventories*. Paper presented at the National Convention of the American Psychological Association, Washington, D. C., September 1976. A,B,D

Prediger, D. J. Contradictory results predicted. *Guidepost*, September 9, 1976, page 2. B

Prediger, D. J. Alternatives for validating interest inventories against group membership criteria. *Applied Psychological Measurement*, 1977, *1*, 275-280. B

On the popularity of sex-restrictive interest inventories (Or, how to stop worrying and love the boom) (ACT Informal Research Report). Iowa City, Iowa: The American College Testing Program, January 1979. A,B

Brennan, R. L., & Prediger, D. J. Coefficient kappa: Some uses, misuses, and alternatives. *Educational and Psychological Measurement*, in press. D

Prediger, D. J. Toward sex-fair assessment of vocational interests. *VocEd, Journal of the American Vocational Association*, in press. A,B

Prediger, D. J. On the virtues of raw-scored interest inventories: Reaction to O'Neil et al. (1979). *Journal of Counseling Psychology*, in press. B,E

Appendix B

LIST OF NON-ACT-SPONSORED REPORTS PROVIDING ACT INTEREST INVENTORY VALIDITY INFORMATION

The following list of reports is not based on an exhaustive search of the literature. The authors welcome information regarding additional studies.

Anadon, M. The American College Interest Inventory: Its usefulness and validity with the Native American student. (Doctoral dissertation, University of North Dakota, 1977). *Dissertation Abstracts International*, 1978, *39*, 122-A. (University Microfilms No. 78-10,309)

Betz, N. E. Criterion-related validity of the Strong-Campbell Interest Inventory and ACT Unisex Interest Inventory for college women: A comparison. *Journal of Vocational Behavior*, in press.

Carew, P. F. An exploratory study of adolescents' career decision-making process and content (Doctoral dissertation, University of Iowa, 1976). *Dissertation Abstracts International*, 1977, *37*, 7540-A. (University Microfilms No. 77-13,064)

Edwards, C. A. The effects of [the ACT] Career Planning Program plus career guidance on the retention rate of students in two South Carolina technical education colleges (Doctoral dissertation, University of South Carolina, 1976). *Dissertation Abstracts International*, 1977, *37*, 6271-A. (University Microfilms No. 77-6755)

Fabry, J., Blake, R., & Seran, G. A construct validation study of the ACT Interest Inventory with high school students. *Measurement and Evaluation in Guidance*, 1978, *10*, 233-236.

Grandy, T. G. Cross-validation of the American College Testing Interest Inventory for University of Iowa students (Doctoral dissertation, University of Iowa, 1975). *Dissertation Abstracts International*, 1976, *36*, 2098-A. (University Microfilms No. 75-23,039)

Lunneborg, P. W. Reducing sex bias in interest measurement at the item level. *Journal of Vocational Behavior*, 1980, *16*, 226-234.

McMahon, D. P. Influencing the degree of relationship between expressed and inventoried interest of college freshmen through the use of a career development class (Doctoral dissertation, University of Arkansas, 1977). *Dissertation Abstracts International*, 1977, *38*, 2560-A. (University Microfilms No. 77-[illegible],326)

Michal, R. D. *ACT Interest Inventory*. Unpublished manuscript, 1979. (Available from Dr. Robert D. Michal, University Counseling Center, University of Kansas, Lawrence, Kansas 66045.)

Scott, T. B., & Anadon, M. A. A comparison of the Vocational interest profiles of Native American and Caucasian college-bound students. *Measurement in Evaluation and Guidance*, 1980, *13*, 35-43.

Swartz, F. *Career Guidance Notebook*. Big Rapids, Michigan: Ferris State College Admissions Office, 1980. (Provides ACT Interest Inventory profiles for 35 vocational/technical programs at publisher's institution.)

Wallace, D. L. A validation study of the unisex form of the ACT Interest Inventory at the University of Southern Mississippi (Doctoral dissertation, University of Southern Mississippi, 1978). *Dissertation Abstracts International*, 1978, *39*, 5338-A. (University Microfilms No. 79-05154).

Warshaw, P. Differential group treatment of career clients according to Holland code (Doctoral dissertation, University of Utah, 1976). *Dissertation Abstracts International*, 1977, *37*, 6286-A. (University Microfilms No. 77-7404).

Appendix C

ACT INTEREST INVENTORY SUMMARY PROFILES FOR 352 EDUCATIONAL AND OCCUPATIONAL GROUPS

Presented in Table C.1 are ACT Interest Inventory profiles for 352 occupational or educational criterion groups representing over 40,000 individuals. The profiles are based on the results of the 11 studies for which the samples are described in the list below. Three of these studies (Data Sources E, F, and G) were performed by researchers at individual institutions. The remaining studies, in which the number of participating institutions ranged from nine to 100, were conducted in conjunction with the ACT Vocational Interest Research Program. Of the 352 criterion groups, 118 were included in cross-sectional studies (N=18,657) and 234 in longitudinal studies (N=21,445). The time interval in the seven longitudinal studies ranged from one to six years. The criterion groups are comprised of first- or second-year college students (139 groups), college seniors (178 groups), and employed adults (35 groups).

Data Sources

The criterion group profiles are based on the following data sources:

A. Seniors at 32 colleges and universities (40 groups, N=11,667) tested concurrently (Hanson, 1974).

B. First-year students at 70 community colleges and 30 vocational/technical institutions (30 groups, N=3,972) tested concurrently (ACT, 1977).

C. College students, primarily sophomores (13 groups, N=905), at a diverse sample of institutions, tested three years earlier as college-bound AAP participants (Hanson, Noeth, & Prediger, 1977).

D. Individuals in data source B (9 groups, N=662) followed up five years after being tested (Hanson, Noeth, & Prediger, 1977).

E. Seniors at a midwestern university (24 groups, N=1,623) tested concurrently (Grandy, 1975).

F. Students in 1- and 2-year technical programs at a midwestern state college (32 groups, N=1,346) tested as college-bound AAP participants (Swartz, 1980).

G. Seniors at a southern university (24 groups, N=1,395) tested concurrently (Wallace, 1978).

H. Vocational/technical students at nine comprehensive community colleges (64 groups, N=6,831) tested as college-bound AAP participants. (See discussion of Map of College Majors in Chapter 6.)

I. Seniors at 16 colleges and universities (90 groups, N=9,391) tested as college-bound AAP participants (Prediger & Lamb, in press; also see discussion of Map of College Majors in Chapter 6).

J. Employed college alumni tested four years previously as seniors at 11 colleges and universities (11 groups, N=1,033) (Prediger & Lamb, 1979).

K. Employed persons (15 groups, N=1,277) tested six years previously as part of the national norm group for the lower level ACT Career Planning Program (ACT, 1974). Current occupation was reported by category (see footnote b). Follow-up procedures are described by Jacobson (1980).

Type of Study

Criterion groups listed in Table C.1 are coded as being concurrent (code = C) or longitudinal (code =L) in design. A "2" or "4" indicates, respectively, a 2-year or 4-year college sample, and "E" signifies employed adults. The criterion consisted of academic major for college students and occupation for employed persons.

Three-letter Holland Codes

Criterion group profiles are indicated in Table C.1 as three-letter Holland codes. The letters are abbreviations for interest types described in Holland's (1973) theory of careers, and indicate the scales on which the group received its highest, second-highest, and third-highest mean scores. Holland types (and corresponding ACT Interest Inventory scales) represented by the letters are as follows: I—Investigative (Science);A—Artistic (Creative Arts); S—Social (Social Service); E—Enterprising (Business Contact); C—Conventional (Business Detail); R—Realistic (Technical).

TABLE C.1

Holland Codes Corresponding to the ACT Interest Inventory Profiles of Various Educational and Occupational Groups

Criterion group	Sex	*N*	Data source	Type of study	Three-letter Holland code[a]
Business Sales and Management					
Agricultural Economics & Business	M	89	I	L-4	REI
Business Administration	M-F	40	F	L-2	AEC
Business Administration (transfer)	M	78	B	C-2	CES
	F	37	B	C-2	CER
Business & Commerce	M	135	C	L-4	CES
	F	136	C	L-4	CES
Business & Commerce, General	M	279	I	L-4	ECI
	F	111	I	L-4	CEI
Business, General	M	543	A	C-4	ECR
	F	175	A	C-4	CER
	M-F	112	G	C-4	ECS
Business Management	M	227	I	L-4	ECS
	F	59	I	L-4	CER
Business & Marketing	M	73	B	C-2	ECS
	F	42	B	C-2	ECA
Hotel & Restaurant Management	M	67	H	L-2	ECR
	F	52	H	L-2	ECA
Management	M	243	H	L-2	ECR
	F	130	H	L-2	CES
Management & Planning[b]	M-F	132	J	L-E	ECR
Management & Planning[b]	M-F	102	K	L-E	ECS
Marketing	M	212	I	L-4	ECS
	F	98	I	L-4	ECA
	M	303	A	C-4	ECR
	F	90	A	C-4	ECA
	M-F	63	E	C-4	ECA
	M	40	H	L-2	ERC
	F	83	H	L-2	EAC
	M-F	52	G	C-4	EAR
Marketing and Advertising	M-F	30	F	L-2	ECA
Personnel Management and Labor Relations	M	53	I	L-4	ESC
	F	44	I	L-4	ECS
Promotion & Direct Contact Sales[b]	M-F	89	J	L-E	ERC
Promotion & Direct Contact Sales[b]	M-F	50	K	L-E	ECI
Public Administration Technology	M	13	H	L-2	SER
	F	36	H	L-2	SAE
Retail Sales & Services[b]	M-F	62	K	L-E	ASE
Business Operations					
Accounting	M	440	I	L-4	CEI
	F	209	I	L-4	CEI
	M	385	A	C-4	CER
	F	140	A	C-4	CER
	M	66	B	C-2	CES
	F	74	B	C-2	CER
	M	47	D	L-E	CEA
	F	80	D	L-E	CER
	M-F	89	E	C-4	CER
	M	87	H	L-2	CER
	F	224	H	L-2	CRE
	M-F	81	G	C-4	CER

Note. Holland codes are provided for a minimum sample size of 20. All codes are based on sex-balanced reporting procedures.

(Continued)

TABLE C.1—*Continued*

Criterion group	Sex	*N*	Data source	Type of study	Three-letter Holland code[a]
Accounting (2- & 4-year programs)	M-F	55	F	L-2	CER
Banking and Finance	M	130	I	L-4	ECI
	F	31	I	L-4	ICR
	M	58	H	L-2	ECR
	F	36	H	L-2	ECR
Clerical & Secretarial Work[b]	F	218	K	L-E	CEAS
Court Reporting	F	140	H	L-2	CEA
	F	33	F	L-2	CEA
Data Processing	M	94	B	C-2	CIE
	F	73	B	C-2	CRI
Keypunch Operations	F	37	H	L-2	CER
Medical Records Technology	F	52	H	L-2	CSE
Medical Records Administration	M-F	25	F	L-2	CIR
Paying, Receiving, & Bookkeeping[b]	M-F	105	J	L-E	CER
Paying, Receiving, & Bookkeeping[b]	M-F	107	K	L-E	CEI
Secretarial Science	F	402	B	C-2	CES
	F	1025	H	L-2	CES
Secretarial Science (office management)	F	28	F	L-2	ECAR
Secretarial Science (law specialty)	F	89	H	L-2	CEA
Technologies and Trades					
Aeronautical Technology	M	24	H	L-2	RIC
Agriculture	M	120	B	C-2	REC
	M	334	A	C-4	RIC
	M	75	H	L-2	RCE
	F	28	H	L-2	RAI
Air Conditioning/Refrigeration Repair	M	88	H	L-2	RCE
Architectural Drafting	M	109	H	L-2	RCE
	M-F	48	F	L-2	RCA
Technical Illustration	M-F	19	F	L-2	RACE
Auto Body Repair	M	89	H	L-2	REC
	M	22	F	L-2	REA
Auto Mechanics	M	297	B	C-2	RCS
	M-F	99	F	L-2	REA
	M	188	H	L-2	RCE
Diesel Mechanics	M	155	H	L-2	RCIE
Computer Programming	M	83	B	C-2	CEI
	F	59	B	C-2	CEI
	M	145	H	L-2	CRI
	F	172	H	L-2	CRE
Construction & Building Technologies	M	111	H	L-2	RAE
	M-F	21	F	L-2	FCE
Construction & Maintenance[b]	M	112	K	L-E	RSI
Cosmetology	F	34	B	C-2	RAIE
	M-F	34	F	L-2	REA
Drafting	M	172	B	C-2	AIR
Avionics Electronics	M	22	F	L-2	RAC
Electronics & Machine Technologies	M	438	H	L-2	RIC
	F	25	H	L-2	RCI
Industrial Electricity	M	29	F	L-2	RIC
Engineering	M	468	A	C-4	RIC
	M	67	C	L-4	RIC
	M-F	64	E	C-4	RIC
Chemical Engineering	M	159	I	L-4	IRC
	F	30	I	L-4	IRC

(Continued)

TABLE C.1—*Continued*

Criterion group	Sex	*N*	Data source	Type of study	Three-letter Holland code[a]
Civil Engineering	M	183	I	L-4	RIC
Civil Engineering Technology	M	38	H	L-2	RIE
Electrical Engineering	M	237	I	L-4	IRC
Electrical Engineering Technology	M	369	B	C-2	IRA
	M		D	L-2	
Mechanical Engineering	M	220	I	L-4	IRC
Engineering Graphics	M	116	H	L-2	RIA
Engineering & Other Applied Technologies[b]	M-F	33	J	L-E	RIC
Engineering & Other Applied Technologies[b]	M-F	108	K	L-E	IRC
Engineering Technologies	M	158	D	C-2	IRE
Firefighting	M	36	H	L-2	RIS
Food Service Technology	F	41	H	L-2	RCE
Forestry & Wildlife	M	52	H	L-2	RIS
	M	133	I	L-4	IRA
	F	33	I	L-4	IRA
Growing & Caring for Plants/Animals[b]	M-F	90	J	L-E	RCI
Heating, Refrigeration & Air Conditioning Repair	M-F	59	F	L-2	REIA
Heavy Equipment Repair	M	123	F	L-2	RCEA
Industrial Education/Technology	M-F	65	G	C-4	REI
Health Optics Technology	M-F	23	F	L-2	RICE
Machine Operating, Servicing & Repairing[b]	M-F	134	K	L-E	RCE
Machine Work	M	32	F	L-2	REC
	M	74	B	C-2	RISA
Mechanical Technologies	M	108	H	L-2	RIC
Miscellaneous Trades	M	405	B	C-2	REI
Printing	M-F	54	F	L-2	RCA
	M	64	H	L-2	REA
Technical Drafting	M-F	50	F	L-2	RAC
Transport Equipment Operation[b]	M	22	K	L-E	RCS
Welding	M	90	H	L-2	RAI
	M-F	22	F	L-2	RIAE
Natural, Social, and Medical Sciences					
Natural Sciences					
Agronomy & Soils Science	M	65	I	L-4	IRA
Animal & Dairy Science	M	145	I	L-4	IRS
	F	60	I	L-4	IRA
Biology	M	231	I	L-4	IAS
	F	147	I	L-4	IRA
Biological Sciences	M	588	A	C-4	IRS
	F	424	A	C-4	IRA
	M	33	C	L-4	IAS
	F	34	C	L-4	IRA
	M-F	86	E	C-4	IRA
	M-F	51	G	C-4	IRS
Microbiology	M	63	I	L-4	IAS
	F	54	I	L-4	IRC
Chemistry	M	109	I	L-4	IAR
	F	34	I	L-4	IRA
Geology	M	66	I	L-4	IAR
	F	20	I	L-4	IRA
Horticulture	M	50	I	L-4	IAC
	F	39	I	L-4	IRA

(Continued)

TABLE C.1—*Continued*

Criterion group	Sex	*N*	Data source	Type of study	Three-letter Holland code[a]
Mathematics	M	69	I	L-4	ICA
	F	53	I	L-4	ICR
	M	272	A	C-4	ICR
	F	217	A	C-4	ICR
	M-F	41	E	C-4	CIR
Mathematics/Computer Science	M-F	67	G	C-4	CIR
Computer Science	M	97	I	L-4	ICR
	F	44	I	L-4	IRC
Natural Sciences & Mathematics[b]	M-F	52	J	L-E	IRC
Natural Sciences & Mathematics[b]	M-F	29	K	L-E	IAS
Physical Science	M	454	A	C-4	IRC
	F	102	A	C-4	IRA
	M-F	35	E	C-4	IRA
	M-F	34	G	C-4	IRA
Science (transfer)	M	88	B	C-2	IRA
Science (miscellaneous)	M	131	D	L-E	
Zoology	M	79	I	L-4	IAR
	F	35	I	L-4	IAR
Social Sciences					
Economics	M	50	I	L-4	AEI
	M	214	A	C-4	CEI
History	M	109	I	L-4	ASE
	F	58	I	L-4	AIE
	M	260	A	C-4	SAE
	F	185	A	C-4	SAE
	M-F	46	E	C-4	$\overline{\text{AS}}\,\overline{\text{EC}}$
	M-F	30	G	C-4	ASE
Political Science	M	310	A	C-4	EAS
	F	83	A	C-4	EAR
	M-F	62	E	C-4	$\overline{\text{EC}}\overline{\text{A}}$
Political Science/Criminal Justice	M-F	90	G	C-4	ESR
Political Science and Government	M	167	I	L-4	AES
	F	71	I	L-4	AIE
Pre-law	M-F	115	E	C-4	$\overline{\text{CE}}\text{A}$
Psychology	M	142	I	L-4	IAS
	F	187	I	L-4	IAS
	M	317	A	C-4	ISA
	M-F	102	E	C-4	$\text{SI}\overline{\text{A}}$
	M-F	33	G	C-4	SAI
Social Science, General	M	286	A	C-4	SER
	F	258	A	C-4	SAE
	M	43	C	L-4	ASE
	F	77	C	L-4	ERA
	M-F	55	E	C-4	SER
	M-F	60	G	C-4	SAR
Social Science (transfer)	M	47	B	C-2	SAE
	F	84	B	C-2	SAE
	M	45	D	L-E	$\overline{\text{SAE}}$
	F	260	D	L-E	$\overline{\text{IS}}\text{A}$
Social Sciences & Legal Services[b]	M-F	22	J	L-E	ISA
Sociology	M	292	A	C-4	SEA
	F	319	A	C-4	SEA
	M-F	60	E	C-4	SEA

(Continued)

TABLE C.1—*Continued*

Criterion group	Sex	*N*	Data source	Type of study	Three-letter Holland code[a]
	M	56	I	L-4	SAE
	F	88	I	L-4	AEI
	M-F	30	G	C-4	SEA
Medical Sciences					
Dentistry	M-F	63	E	C-4	RIC
Dental Hygiene	F	78	F	L-2	IREC
	F	71	H	L-2	IRS
Foods & Nutrition	F	88	I	L-4	IRA
Health Sciences/Services, General	M	272	A	C-4	SIR
	F	437	A	C-4	ISR
	M	28	C	L-4	IRA
	F	58	C	L-4	IRA
	F	35	H	L-2	ISR
Inhalation Therapy Technology	F	39	H	L-2	ISA
Medicine	M-F	156	E	C-4	ISR
Medical or Biological Laboratory Technology	F	42	H	L-2	ICA
Medical Assisting Technologies	F	224	B	C-2	ISR
Medical Technology	M-F	37	E	C-4	IRC
Medicine & Medical Technologies[b]	M-F	78	J	L-E	IRS
Medicine & Medical Technologies[b]	M-F	43	K	L-E	ICR
Nuclear Medicine Technology	M-F	16	F	L-2	IRC
Optometric Technology	M-F	29	F	L-2	RIEC
Pharmacy	M	32	I	L-4	ICR
	F	34	I	L-4	ICR
	M-F	65	E	C-4	ICRE
Pharmacy Assisting	M-F	76	F	L-2	CIR
Pre-medicine	M	56	I	L-4	IAS
	F	24	I	L-4	IRA
Radiologic Technology	M-F	41	F	L-2	IRS
	F	40	H	L-2	ICR
Respiratory Therapy	M-F	27	F	L-2	IRS
Creative and Applied Arts					
Applied Arts, General	M	104	H	L-2	RAE
	F	85	H	L-2	ARE
Applied Arts, Verbal[b]	M-F	23	J	L-E	AEI
Applied Arts, Visual[b]	M-F	56	J	L-E	ARI
Art	M	350	A	C-4	ARE
	F	269	A	C-4	ARE
	M	35	I	L-4	ARS
	F	61	I	L-4	ARI
	M-F	35	E	C-4	ARI
Arts (Fine and Applied)	M-F	62	G	C-4	ARS
Arts and Humanities	M	43	B	C-2	SAE
	F	56	B	C-2	ARS
Arts and Humanities (transfer)	M	48	D	L-E	ASI
	F	18	D	L-E	ASI
Commercial and Graphic Arts	F	27	B	C-2	ARE
	F	33	D	L-E	
	M-F	48	F	L-2	ARE
Architecture	M	143	I	L-4	ARI
	F	24	I	L-4	RIA
Landscape Architecture	M	47	I	L-4	ARS

(Continued)

TABLE C.1—*Continued*

Criterion group	Sex	*N*	Data source	Type of study	Three-letter Holland code[a]
Broadcast Journalism	M	51	I	L-4	AES
	F	54	I	L-4	AER
	M	59	H	L-2	ERA
	F	51	H	L-2	AES
Journalism	M	149	I	L-4	AES
	F	193	I	L-4	AER
Clothing & Textiles	F	154	I	L-4	AEI
Communications	M-F	41	G	C-4	AES
English	M	55	I	L-4	ASI
	F	131	I	L-4	AIE
English and Literature	M	188	A	C-4	ASI
	F	407	A	C-4	ASE
	M-F	28	E	C-4	ASCE
	M-F	22	G	C-4	AES
Foreign Languages	M	140	A	C-4	ASR
	F	407	A	C-4	ASI
	M-F	32	E	C-4	AECR
Home Decoration & Interior Design	F	105	I	L-4	AER
Interior Design	F	80	H	L-2	ARE
Humanities and Letters	M	25	C	L-4	ASI
	F	20	C	L-4	ARE
Modern Languages	M	28	I	L-4	AISE
	F	111	I	L-4	AIR
Music	M	44	I	L-4	ASI
	F	70	I	L-4	AIR
Photography	F	22	H	L-2	RAE
Speech	M	25	I	L-4	ASE
	F	70	I	L-4	AEI
Speech and Dramatic Arts	M-F	32	E	C-4	AER
Social, Health, and Personal Services					
Child Care	F	101	H	L-2	SAE
Family Relations & Child Development	F	137	I	L-4	SAE
Criminal Justice (law enforcement)	M	47	I	L-4	ESAR
	F	37	I	L-4	ESA
	M	356	H	L-2	RSE
	F	151	H	L-2	SEA
Education, Art	F	52	I	L-4	ARS
	F	122	A	C-4	ARS
Education, Business	M	113	A	C-4	CER
	F	238	A	C-4	CES
	M-F	23	G	C-4	ECS
Education, Elementary	M	39	I	L-4	SAE
	F	527	I	L-4	SAE
	M	258	A	C-4	SRA
	F	878	A	C-4	SRA
	M-F	121	E	C-4	SEC
	M-F	94	G	C-4	SAE
Education, General	M	35	C	L-4	SEC
	F	214	C	L-4	SAC
Education, Music	M	53	I	L-4	ASI
	F	65	I	L-4	AIS
	M	195	A	C-4	ASR
	F	225	A	C-4	ASR
	M-F	25	E	C-4	ACI
	M-F	58	G	C-4	ASR

(Continued)

TABLE C.1—*Continued*

Criterion group	Sex	*N*	Data source	Type of study	Three-letter Holland code[a]
Education, Physical	M	77	I	L-4	SRE
	F	195	I	L-4	RSI
	M-F	29	E	C-4	SECR
Physical Education, Health, Recreation	M-F	84	G	C-4	RSA
Education, Special	F	243	I	L-4	SAE
	M-F	58	G	C-4	SAR
Educational Teacher Assisting	F	55	H	L-2	SAE
Educational & Social Services[b]	M-F	353	J	L-E	SAR
Educational & Social Services[b]	M-F	115	K	L-E	SIA
Dental Assisting	M-F	48	F	L-2	RECI
	F	116	H	L-2	SREC
	F	116	B	C-2	ASR
Dental Laboratory Technology	M-F	33	F	L-2	RIC
Health Services	M-F	54	G	C-4	ISA
Home Economics, General & Education	F	158	I	L-4	AESR
Home Economics (miscellaneous)	M-F	59	G	C-4	EAS
	F	62	H	L-2	AES
Law Enforcement & Protective Services[b]	M	23	K	L-E	SCE
Medical Assisting	F	32	F	L-2	CIRE
Medical Assisting and Medical Office Technology	F	45	H	L-2	SCE
Nursing (RN)	F	213	I	L-4	ISR
Nursing (RN—4-yr. degree)	F	113	G	C-4	ISA
	M-F	182	E	C-4	SIA
Nursing (RN—2-yr. degree)	F	260	B	C-2	ISA
	F	398	H	L-2	ISA
	M-F	50	F	L-2	ISR
Nursing (LPN)	F	155	H	L-2	SIR
	F	255	B	C-2	ISA
Nursing & Human Care[b]	F	93	K	L-E	ISR
Occupational Therapy Technology	F	22	H	L-2	SIR
Parks & Recreation Mgt.	M	44	I	L-4	SAE
	F	84	I	L-4	IRS
Personal & Household Services[b]	M-F	59	K	L-E	ASE
Philosophy and Religion	M	149	A	C-4	ASI
Physical Therapy Assisting	F	27	H	L-2	SIA
Police Science	M	62	B	C-2	SE AC
Psychiatric Technology	F	24	H	L-2	SIE
Recreation	M	21	H	L-2	RSE
	F	38	H	L-2	SAR
Social Work	M	22	I	L-4	SAI
	F	129	I	L-4	SEA
	F	28	H	L-2	ASR
Speech Correction	F	120	I	L-4	SAI
Speech/Hearing	F	22	G	C-4	SAE

[a]A dash over two codes indicates mean scores were "tied," i.e., differed as follows: Studies A, B, and C—less than .05 standard score units; Studies D and E—less than .5 standard score units; Studies F, H, I, and J—no difference when rounded to .1 standard score units; Study G—no difference when rounded to .1 percentile unit.

[b]Results for groups of similar occupations are reported by job family. The ACT Job Family List (Figure 1.4) provides examples of occupations in each job family. Since the job families, which span the world of work, include many specific occupations, males and females in the same job family may be employed in somewhat different occupations. Thus, Holland codes for combined-sex samples are reported unless there were relatively few members of a given sex.

Appendix D

UNIACT ITEMS

College planning usually involves career planning. Your scores on the ACT Interest Inventory will suggest educational programs and occupations you may want to consider—career options you may not otherwise have considered.

Directions

Please indicate how much you would like doing each of the activities listed below. Mark a response to an activity even if you are uncertain how you feel about it. Consider whether you would **like** or **dislike** an activity rather than whether you have the ability to do it.

For **each** question, choose one of the answers from the scale below and mark the corresponding letter on page 2 of your registration folder. Try to answer **like** or **dislike** to as many questions as possible.

I would **dislike** doing this activity ..... D
I am **indifferent** (don't care one way or the other) I
I would **like** doing this activity L

1. Visit a science museum
2. Play jazz in a combo
3. Help settle an argument between friends
4. Promote the opening of a new shopping center
5. Take inventory in a store
6. Run a lawnmower
7. Study the effects of vitamins on animals
8. Compose theme music for movies
9. Be the leader of a group or social club
10. Manage a small business

11. Sort, count, and store supplies
12. Package meat in a grocery store
13. Invent new food substitutes
14. Write a movie script
15. Explain legal and civil rights to people
16. Plan work for other people
17. Balance a checkbook
18. Pump gas in a service station
19. Determine the origin of rock formations
20. Make creative photographs

21. Give first aid to an injured person
22. Work for a consumer protection agency
23. Figure shipping costs for catalog orders
24. Engrave lettering or designs on a trophy or plaque
25. Learn about star formations
26. Select music to play for a local radio station
27. Teach social studies in a 2-year college
28. Interview workers about company complaints
29. Count and sort money
30. Build a picture frame

31. Study plant diseases
32. Write short stories
33. Help people during emergencies
34. Manage a new sales campaign
35. Keep expense account records
36. Drive a bus
37. Study chemistry
38. Read about the writing style of modern authors
39. Teach high school students
40. Hire a person for a job

41. Make charts or graphs
42. Grind lenses for eyeglasses
43. Work in a science lab
44. Compose or arrange music
45. Help friends with their problems
46. Conduct business by phone
47. Operate an IBM machine
48. Read meters for a gas or electric company
49. Study biology
50. Sketch and draw pictures

51. Give legal advice to the poor
52. Make business trips
53. Make out income tax returns
54. Fix a toy
55. Use a microscope or other lab equipment.
56. Prepare drawings to illustrate a magazine story
57. Help rescue someone in danger
58. Assume leadership in a business or company
59. Set up a bookkeeping system
60. Build furniture

61. Read books or magazines about new scientific findings
62. Work on your own as an artist
63. Take part in a small group discussion
64. Run a hotel or motel
65. Find errors in a financial account
66. Fix shoes
67. Read about the origin of the earth, sun, and stars
68. Write critical reviews of Broadway plays
69. Counsel people using drugs
70. Sell appliances

71. Look for errors in the draft of a report
72. Watch for forest fires
73. Learn to use an electron microscope
74. Design a metal sculpture
75. Teach people a new hobby
76. Campaign for a political office
77. Write payroll checks
78. Repair damage to a tree after a storm
79. Measure chemicals in a test tube
80. Draw cartoons

81. Teach high school courses
82. Work on a city council
83. Calculate the interest on a loan
84. Do mechanical drawings
85. Learn how the brain works
86. Play in a band
87. Be a counselor
88. Settle insurance claims
89. Use a computer
90. Rivet sheet metal or leather

Reprinted from the ACT Assessment Program registration packet. In VIESA, items not scored on the Data/Ideas and Things/People Summary Scales are omitted.

Appendix E

UNIACT SCORING PROCEDURES AND NORMS TABLES

Scoring Keys

Six Basic Interest Scales

Responses to UNIACT items are scored as follows: *Dislike* = 1, *Indifferent* = 2, and *Like* = 3. The average item response is calculated for each of the six 15-item scales by summing the item scores and dividing by the number of items answered. In AAP processing, scores are not computed if fewer than ten items are answered on any scale.

The item content for each of the six scales is shown below. (Item numbers correspond to those in the copy of UNIACT provided in Appendix D.)

The Science Scale: 1, 7, 13, 19, 25, 31, 37, 43, 49, 55, 61, 67, 73, 79, 85

The Creative Arts Scale: 2, 8, 14, 20, 26, 32, 38, 44, 50, 56, 62, 68, 74, 80, 86

The Social Services Scale: 3, 9, 15, 21, 27, 33, 39, 45, 51, 57, 63, 69, 75, 81, 87

The Business Contact Scale: 4, 10, 16, 22, 28, 34, 40, 46, 52, 58, 64, 70, 76, 82, 88

The Business Detail Scale: 5, 11, 17, 23, 29, 35, 41, 47, 53, 59, 65, 71, 77, 83, 89

The Technical Scale: 6, 12, 18, 24, 30, 36, 42, 48, 54, 60, 66, 72, 78, 84, 90

D/I and T/P Scales

The 30-item Data/Ideas and Things/People Summary Scales (D/I and T/P Scales) are scored as follows. (Item numbers correspond to those in the copy of UNIACT provided in Appendix D.)

The D/I Scale:

1. Begin with a D/I raw score of 15.
2. Add 1 to the raw score for each of the following *Data* items marked *Like*.

   5, 11, 17, 23, 35, 40, 46, 52, 53, 59, 64, 65, 70, 77, 83
3. Subtract 1 from the raw score for each of the following *Ideas* items marked *Like*.

   7, 31, 32, 37, 43, 49, 50, 55, 56, 61, 62, 73, 79, 80, 85

The T/P Scale:

1. Begin with a T/P raw score of 15.
2. Add 1 to the raw score for each of the following *Things* items marked *Like*.

   6, 12, 18, 19, 24, 30, 36, 41, 42, 48, 60, 66, 84, 89, 90
3. Subtract 1 from the raw score for each of the following *People* items marked *Like*.

   3, 9, 15, 16, 27, 34, 39, 45, 51, 63, 68, 69, 76, 81, 87

Norms Tables

Basic Interest Scales

Basic interest scale norms for college-bound students, the UNIACT norms used in ACT Assessment Program processing, are shown in Table E.1. Corresponding norms for a national sample of 11th graders are shown in the first six columns of Table E.2. The 11th grade norms may be used in the ACT CPP when it is next revised.

A comparison of the two norms tables indicates that Technical Scale scores are higher for the more heterogeneous 11th grade norms sample, whereas the Science, Creative Arts, and Social Service Scale scores are higher for the college-bound sample. However, differences are not substantial. The largest difference is on the Science Scale, on which the median response average (1.97) for the 11th grade sample falls at about the 40th percentile on the college-bound norms.

TABLE E.1

UNIACT Basic Interest Scale Norms for College-bound Students

Response average[a]	Science		Creative Arts		Social Service		Business Contact		Business Detail		Technical	
	T[b]	PR[c]	T[b]	PR[c]	T[b]	PR[c]	T[b]	PR[c]	T[b]	PR[c]	T[b]	PR[c]
1.0	26	1	24	1	20	1	21	1	26	1	27	1
1.1	31	3	28	1	22	1	25	1	30	2	32	4
1.2	35	7	32	4	24	1	29	2	34	5	35	7
1.3	37	10	34	5	26	1	32	4	36	8	38	12
1.4	40	16	36	8	27	1	34	5	38	12	41	18
1.5	42	21	38	12	30	2	36	8	40	16	44	27
1.6	43	24	40	16	32	4	38	12	42	21	46	34
1.7	44	27	42	21	34	5	40	16	44	27	48	42
1.8	45	31	43	24	36	8	42	21	46	34	50	50
1.9	47	38	45	31	38	12	44	27	48	42	52	58
2.0	48	42	47	38	40	16	46	34	50	50	54	66
2.1	49	46	48	42	42	21	48	42	52	58	56	73
2.2	50	50	50	50	44	27	50	50	53	62	58	79
2.3	52	58	51	54	46	34	52	58	55	69	61	86
2.4	53	62	53	62	48	42	54	66	56	73	63	90
2.5	54	66	54	66	50	50	57	76	58	79	65	93
2.6	55	69	56	73	53	62	59	82	60	84	67	96
2.7	57	76	58	79	56	73	62	88	62	88	69	97
2.8	60	84	61	86	59	82	65	93	64	93	71	98
2.9	63	90	64	93	63	90	69	97	66	95	74	99
3.0	69	97	72	99	70	98	77	99	72	99	77	99

Note. These norms were developed from records of 1,247 males and 1,693 females in the UNIACT AAP norms sample, described in Chapter 3.

[a]The procedure for computing the response average is described in the text of this appendix.

[b]T = Normalized standard score with $M = 50$ and $SD = 10$.

[c]PR = Percentile rank.

D/I and T/P Scale Norms

College-bound norms for the D/I and T/P Scales are shown in Table E.3; 11th grade norms are shown in the final two columns of Table E.2. Both of these norms sets are shown for illustration purposes only. In AAP processing, scores on the D/I and T/P dimensions are computed through the procedure described in the following section. In VIESA, a counselee's World-of-Work Map region is determined directly from the D/I and T/P raw scores through use of a scoring grid, as explained in the final section of this appendix.

A comparison of the two norms tables indicates that the 11th grade norms sample, in comparison with the college-bound sample, had somewhat higher data (versus ideas) interests, and somewhat higher things (versus people) interests. These differences follow the pattern indicated above for the basic interest scales and, like those differences, are not substantial. The median D/I and T/P scale scores for the 11th grade sample fall at about the 60th and 66th percentiles, respectively, on the college-bound norms.

Computation of D/I and T/P Scores in AAP Processing

In UNIACT processing for the AAP, D/I and T/P standard scores (mean of 50 and standard deviation of 10 for the UNIACT AAP norms sample) are obtained from linear composites of the six basic interest scales using the formulas below. The computed scores are the coordinates for the Map of College Majors. They are also used to compute the World-of-Work Map region number (as described in the following section).

TABLE E.2

UNIACT Norms for Grade 11

Stanine category	Score corresponding to upper limit of stanine category[a]							
	Science	Creative Arts	Social Service	Business Contact	Business Detail	Technical	D/I Scale	T/P Scale
9	3.00	3.00	3.00	3.00	3.00	3.00	30.0	30.0
8	2.86	2.79	2.90	2.66	2.76	2.60	22.4	19.6
7	2.67	2.67	2.77	2.52	2.55	2.41	20.2	17.8
6	2.39	2.47	2.60	2.32	2.33	2.20	17.9	15.9
5	2.11	2.25	2.43	2.14	2.11	2.00	15.6	14.1
4	1.83	2.02	2.26	1.94	1.89	1.79	13.4	12.2
3	1.56	1.80	2.09	1.75	1.68	1.60	11.1	10.4
2	1.29	1.59	1.92	1.56	1.45	1.40	8.8	8.5
1	1.09	1.35	1.66	1.36	1.24	1.20	6.6	6.7
Median	1.97	2.13	2.34	2.03	2.00	1.90	14.5	13.1

Note. National norms for the six basic interest scales were derived from UNIACT equivalents of the ACT VIP-A scores of approximately 9,300 11th grade students in the lower-level ACT CPP national norms group (ACT, 1974). A 10% sample of this group was used to generate the Data/Ideas and Things/People Summary Scale norms.

[a]Response averages are reported for the six basic interest scales, and raw scores for the D/I and T/P Scales. (Procedures for obtaining these scores are provided in the text of this appendix.)

$$D/I = \sum_{i=1}^{6} W_{1i} T_i + 50$$

$$T/P = \sum_{i=1}^{6} W_{2i} T_i + 50$$

In the formulas, T_i represents the six UNIACT basic interest standard scores, and W_{1i} and W_{2i} represent, respectively, the D/I and T/P dimension weights. These weights were derived through the application of an arbitrary factor extraction procedure (Cooley and Lohnes, 1971, pp. 137-143) to the intercorrelation matrix for the UNIACT AAP norms sample. Chapter 5 describes how the theory-based arbitrary dimensions were defined. The correspondence of weights to scales is indicated below.

i	W_{1i}	W_{2i}	Scale
1	-.455	+.292	Science
2	-.455	-.302	Creative Arts
3	.000	-.594	Social Service
4	+.455	-.292	Business Contact
5	+.455	+.302	Business Detail
6	.000	+.594	Technical

TABLE E.3

UNIACT Data/Ideas and Things/People Summary Scale
Norms for College-bound Students

Raw Score[a]	D/I Scale		T/P Scale		Raw Score[a]	D/I Scale		T/P Scale	
	T[b]	PR[c]	T[b]	PR[c]		T[b]	PR[c]	T[b]	PR[c]
0	22	1	20	1	16	55	69	60	84
1	25	1	23	1	17	56	73	63	90
2	28	1	26	1	18	58	79	65	93
3	31	3	30	2	19	59	82	67	96
4	34	5	33	4	20	61	86	69	97
5	36	8	35	7	21	62	88	71	98
6	38	12	38	12	22	64	92	73	99
7	40	16	40	16	23	65	93	75	99
8	42	21	43	24	24	67	96	77	99
9	44	27	45	31	25	69	97	78	99
10	45	31	47	38	26	70	98	79	99
11	47	38	49	46	27	72	99	80	99
12	48	42	51	54	28	74	99	80	99
13	50	50	54	66	29	76	99	80	99
14	52	58	56	73	30	78	99	80	99
15	53	62	58	79					

Note. These norms were developed from records of 1,247 males and 1,693 females in the UNIACT APP norms sample, described in Chapter 3.

[a]The procedure for computing the raw score is described in the text of this appendix.

[b]T = Normalized standard score with $M = 50$ and $SD = 10$.

[c]PR = Percentile rank.

Computation of World-of-Work Map Region

AAP Processing

The World-of-Work Map region number is computed in AAP processing as follows. (D/I, T/P, and T_i are the standard scores identified in the previous section.)

1. If the absolute value of both D/I - 50 and T/P - 50 is 3.0 or less (a "flat" profile), a region 99 is assigned.
2. If T_3 *and* T_6; *or* $\frac{T_1 + T_2}{2}$ *and* $\frac{T_4 + T_5}{2}$ are greater than 61 ("conflicting" profile), a region 99 is assigned.
3. Otherwise, θ is computed as arc tan $\frac{D/I - 50}{T/P - 50}$.
4. The region corresponds to θ as indicated below:

θ	Region	θ	Region	θ	Region
0-29.9°	6	120-149.9°	2	240-269.9°	10
30-59.9	5	150-179.9	1	270-299.9	9
60-89.9	4	180-209.9	12	300-329.9	8
90-119.9	3	210-239.9	11	330-359.9	7

5. The screens for region 99 are revised periodically on the basis of experience. Generally, about 10% of the persons taking UNIACT fall in region 99. These persons are referred to their profile for the six basic interest scores.

VIESA Hand Scoring

As discussed in Chapter 3, the World-of-Work Map region number is obtained in VIESA through a self-scoring procedure employing a scoring grid. The X and Y axes of the grid (shown in Figure E.1) are scaled to achieve the effect of converting raw scores to linear standard scores. The "1st score" on the grid is the T/P raw score, and the "2nd score" is the D/I raw score. Region "?," shown in the center of the grid, indicates a "flat" (undifferentiated) profile.

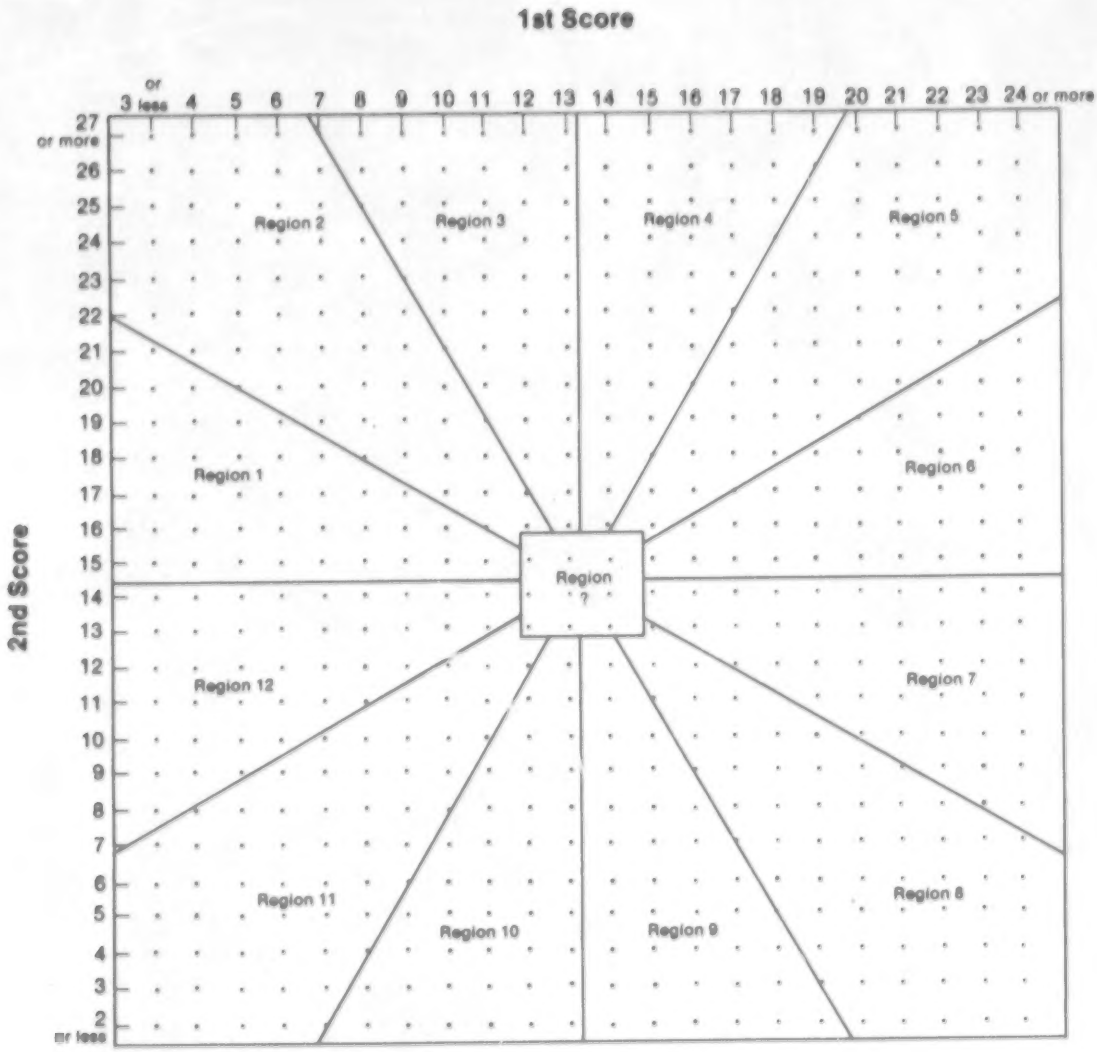


Figure E.1. The UNIACT scoring grid used in VIESA.

Appendix F

STATEMENT OF COMPLIANCE WITH FEDERAL LEGISLATION AND NIE GUIDELINES REGARDING SEX-FAIR INTEREST ASSESSMENT

In preparing the Unisex Edition of the ACT Interest Inventory (UNIACT) and its supporting materials, ACT gave careful attention to Federal legislation (Title IX of the Education Amendments of 1972) prohibiting sex discrimination in appraisal and counseling materials and to the Guidelines for Assessment of Sex Bias and Sex Fairness in Career Interest Inventories (Diamond, 1975), developed under the auspices of the National Institute of Education (NIE). Information bearing on the sex-fairness of UNIACT and its auxiliary materials is summarized below.

Title IX

This section describes UNIACT compliance with Title IX of the Education Amendments of 1972. Because the evidence accumulated on this topic is extensive, only a brief summary is given. Chapters 2-6 in this report provide more detailed information. Copies of the other materials cited can be obtained by writing the Student Development Department, ACT Research and Development Division.

Pertinent Title IX Regulations (Section 86.36 of Subpart D)

Counseling. A recipient shall not discriminate against any person on the basis of sex in the counseling or guidance of students or applicants for admission.

Use of appraisal and counseling materials. A recipient which uses testing or other materials for appraising or counseling students shall not use different materials for students on the basis of their sex or use materials which permit or require different treatment of students on such basis unless such different materials cover the same occupations and interest areas and the use of such different materials is shown to be essential to eliminate sex bias.

The following criteria, which appeared in the 7/22/76 issue of *Guidepost*, were developed by the Office of Civil Rights to clarify the implications of the regulations.

1. Technical information must be developed to provide a rationale for separate norms by sex to demonstrate that such sex-norm separation is essential to the elimination of sex bias.
2. Identical vocational areas and/or occupational titles must be indicated for each sex and the sex composition of the norming groups for each scale must be clearly indicated in the technical information accompanying the instruments.
3. Reporting the scores for one sex on scales normed or constructed on the basis of data from the other sex must be supported by a pattern of validity established for males and females scored on pairs of similar or same-named scales measuring the same constructs.
4. Clients must receive scores on both sets of sex norms and the interpretive materials to help them see there is no activity or occupation that is exclusively male or female.

Compliance of ACT-IV with Criteria

The clarifying criteria essentially constitute more specific statements of the original Title IX regulations. The manner in which UNIACT complies with each of these criteria is discussed below.

Criterion 1. UNIACT, which replaced an earlier edition of the ACT Interest Inventory in the fall of 1977, uses combined-sex norms. The psychometric characteristics of UNIACT are described in *ACT Research Report 78* (Hanson, Prediger, and Schussel, 1977) and in *ACT Research Report 79* (Prediger and Johnson, 1979).

Criterion 2. The educational and vocational areas covered in UNIACT reports are identical for males and females as are the accompanying interpretive materials. Special care was taken to use sex-neutral language in describing occupations and college majors. The sex composition of the norming groups is reported in the users' manuals accompanying each report.

Criterion 3. UNIACT does not use pairs of similar or same-normed scales. This reporting procedure is typical of empirically keyed interest inventories such as the Strong Vocational Interest Blank and the Kuder Occupational Interest Survey.

Criterion 4. UNIACT reporting procedures are designed to counteract the effects of sex-role stereotypes on career planning. As documented in *ACT Research Reports 78* and *79*, the full range of career options is suggested to members of both sexes. The materials accompanying each score report contain specific suggestions for relating interests to educational majors and occupations. Materials for counselors and advisors discuss the use of UNIACT in helping females and males consider the full range of career options.

NIE Guidelines

This section summarizes material indicating compliance with the NIE guidelines. Pertinent references to chapters in this technical report are provided for each subsection.

The Inventory Itself

UNIACT uses the same inventory, scales, scoring procedures, and report forms for males and females. Gender-neutral terminology is employed throughout. UNIACT is one of the first interest inventories to be entirely composed of items chosen to represent experiences and activities equally familiar to males and females and favored by similar proportions of males and females (Chapter 3). Since items are sex-balanced, it follows that sex balance is also achieved at the scale level; that is, similar proportions of males and females obtain their highest score on each of the six scales (Chapter 4). This feature makes the use of combined-sex norms possible without sacrificing validity for either gender and results in similar career suggestions for both sexes.

Technical Information

Chapters 2 through 6 of this report provide a summary of psychometric evidence indicating the extent to which UNIACT meets NIE guidelines. Further information is available in *ACT Research Reports 78* and *79* and the numerous studies conducted as part of ACT's Vocational Interest Research Program (Appendix A).

As stated in the previous section, the use of sex-balanced items within scales ensures that the response distributions for each item are similar for males and females, thus justifying the use of the same scales for males and females. The same vocational areas are indicated for males and females. Likewise, suggested or implied career options are distributed similarly for both genders.

Sex composition of norm groups is described in the user's manuals for the programs which use UNIACT as a component, as well as in this report (Chapter 3 and Appendix E). This report provides the most recent psychometric data, including data for criterion groups. Studies which establish UNIACT validity for male and female minority group members have been completed (Chapter 8).

Interpretive Information

The counselor's manuals, student score reports, and student booklets for programs incorporating UNIACT are designed to facilitate appropriate, non-sexist interpretation of scores based on UNIACT's combined-sex norms. The materials are written in gender-neutral language. Environmental and cultural factors that may influence vocational choices of males or females are acknowledged, and ways to encourage students to broaden their range of career options are suggested. Both males and females are encouraged to consider *all* career options, including those not traditional for their sex. Exploratory experiences to broaden occupational knowledge and interests are suggested. (Because of space limitations and the wide range of other measures included with UNIACT in ACT's various programs, extensive case studies are not presented in the UNIACT interpretive materials.)

Concluding Statement

ACT recognizes that interest inventories can simply reinforce existing occupational sex-role stereotypes. Or, they can open new career areas for consideration. Beginning with the work of Cole, Hanson, and Prediger, in conjunction with the 1974 National Institute of Education study of sex-fair procedures for assessing vocational interests (Diamond, 1975), staff members at ACT have conducted a series of studies (20 of which have been published in professional journals or books) concerned with issues of sex bias (see Appendix A). These issues will receive continued attention in ACT's Interest Research Program.

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